Organic Gardening

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J. I. Rodale, Editor and Publisher
Heinrich Meyer, Ph. D., Assistant Editor
Sir Albert Howard, C.I.E., M.A., Associate Editor

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With The Editor

Danger Ahead

A FEW months ago we received a letter from one of our readers which gave us a nasty jolt. The danger it suggests is so extreme and obvious and its possibilities for mischief so fearful that the Government and general public must be made aware of it as soon as possible. I am going to give the letter in full without mentioning the sender's name.

Eaton Rapids, Mich.
Jan. 23, 1946

Dear Mr. Rodale:

Will you please send me a written statement telling the exact harm that Chemical Fertizilers do to the soil. When using such fertilizers as super phosphate 0-20-0 and 3-12-12 and so on.

The reason I want a statement in letter form is because, I am getting a 50 ton car of raw Rock Phosphate this spring. I intend to cover our farm with 1000 lbs. to the acre. I went to the Eaton County AAA Comm. Chairman at Charlotte, Michigan to see if they did make payments on applying Rock Phosphate to the soil, the Chairman knew nothing about Rock Phosphate so he looked in his books to see if the government did make payments on it. In the back of their book he found that they did make payments in 1945. This was in the month of November. I told him that I was going to get a car load of it to spread on our farm and that it was a better type of practice than using super Phosphate and Chemical Fertilizers, that it did not harm the bacteria in the soil like chemicals did. Of course he did not believe what I said because I did not carry the name of a professor and a set of whiskers. Well, this year our county AAA committee-men made up their minds not to make payment on Rock Phosphate this year, but they will pay on Acid Phosphate (super phosphate). Our National AAA at Washington, D. C. allows them to make payment.

I want to write the National AAA at Washington, D. C. and find out why Eaton county is not going to make payment for a sound practice of soil conservation, and make payments on an unsound practice.

This is why I want a written statement.

Very truly yours,
(Name Withheld)

Through the mails I gave this man sufficient information with which to convince the local AAA people that the application of raw phosphate rock was a helpful agricultural practice that would build up the fertility of the soil and as such would entitle the farmer to a Government subsidy payment. For those who are not familiar with the manner in which the AAA program operates let me explain.

This organization was formed during depression days by an act of Con-

gress to extend subsidies to farmers to tide them over the dark days of the thirties, but it has never been discontinued. The basis of payment is various. The AAA will tell a farmer the maximum acreage of wheat or potatoes he may plant. If he does not exceed that he receives a certain payment. The purpose here is to prevent market gluts which unfavorably affects the price structure.

If the farmer plants a stand of forest, or engages in certain soil erosion control practices or if he spreads lime or uses superphosphate, a strong chemical fertilizer, he secures a payment for each practice. But if he spreads organic compost he doesn't get a nickle for it. I feel certain that the National AAA organization in Washington countenances the use of raw phosphate rock as being entitled to a payment, but local boards here and there may not be aware of it.

Superphosphate is made from raw phosphate rock to which has been added sulphuric acid. This chemical action makes the slower acting phosphate rock more quickly available. It becomes soluble or available and makes the crop react immediately. The phosphate rock costs perhaps only one-third as much as the super and is more slow in its availability but soon begins to work in the interest of the farmer. It does not contain the poisonous, corrosive sulphur which in many ways interferes with Nature's processes, resulting in the plant absorbing the wrong kind of elements from the soil. Farmers are getting wise to this situation. In Illinois in the year 1944, over 200,000 tons of phosphate rock were used as against a mere 27,949 tons of superphosphate, of which 20,209 tons were 45 per cent quality. The total of commercial fertilizers was 169,127 tons or less than that of phosphate rock.

I am sure that in that state the AAA accepts raw phosphate rock as a beneficial soil amendment which entitles the farmer to a subsidy payment.

The danger that this letter seems to point to is that by means of actual legislation, an organic farmer may sometime in the future, be prevented from running his farm on an exclusively organic basis, not only because of subsidies he would have to forego but also because of laws that might force him to use chemical fertilizers against his will. It is possible that should more and more persons adopt the organic methods, and serious inroads be made into the output of chemical fertilizer companies, the latter through legislative lobbies, may attempt to do something about it. When that time comes we must all be ready to give them combat.

To give you another example of what the future may hold, on February 1, there goes into effect in the State of Oregon a cherry fruit fly control order which covers three sections,—Hood River, Wasco, Linn, Marion, Polk and Yamhill counties. This law forces anyone owning a cherry tree in those counties to spray it or chop it down. If you have only one tree, and don't intend to sell any of its fruit, you still must spray or chop it down. Here is a letter from one of our readers in Oregon who brought this matter to our attention:

Aumsville, Oregon
Feb. 1, 1946.

Rodale Press
Emmaus, Pa.

Dear Sir:

Enclosed is a clipping from our local paper that I think will interest you, and show what crazy laws some people can get passed. This is going to hit some kind of hard, those who have a tree or two solely for their own use. It will cost more to have it sprayed than the cherries will be worth to them, so maybe it will mean cut down the tree. Everybody can't afford a spray rig. I have some 300 trees that I think I'll take out before I spray, of course they are young trees, the oldest 8 years the rest about 5 years. There is a large orchard (over 200 acres) about 6 miles from my place that follows all the rules for spraying, and for the last 2 years they

had more worms than anyone in the country.

They say in the paper that there weren't any objections to setting up these control areas. I think the reason for that was, not too many knew about such a law being framed. From now on they'll hear the objections.

It's too bad that "Organic Gardening" wasn't started about 50 years ago, maybe we wouldn't be bothered with such laws now.

Very truly yours,
Thos. W. Keen

Unfortunately spraying is not the answer. Not a word is mentioned in the Oregon control order of building up the resistance of the trees by enriching the soil with humus. It is rather ironic that Oregon happens to be the most sprayed state in the union. Certain orcharding sections of that commonwealth have poisoned the soil with the toxic residues of these sprays to such an extent that nothing will grow in them, not even weeds.

The state employs God knows how many inspectors to control and observe conditions brought about by insect infestation. In addition the growers lose millions because of insect destruction. They spend millions for poison sprays. If this money could be spent to furnish free compost to orchardists the state would be better off in the end, in better crops, better business and better health of the people eating the fruits.

Perhaps it may be advisable to write about these matters to your congressman, senators, to the Secretary of Agriculture, to President Truman, and show them that you are one of a group of persons that will oppose vigorously any such tendency in legislation that will prevent us from putting into practice a 100% organic method on our farms and in our gardens. Ask them to enact legislation that will grant subsidy payments to farmers who spread compost on their lands, a much healthier practice than applying superphosphate.

The U. S. Government actually has its own plants where it manufactures one of the strongest chemical fertilizers—superphosphate, which it distributes in lieu of cash as farm subsidy payments. This should be discontinued. Let the Government conduct an investigation to prove whether superphosphate is good or bad for the land. But to think that our own Government directly contributes to turning out second-rate food crops from a health point of view is rather disheartening. May our Government soon see the error of its ways.

J. I. RODALE

Do You Want to Help the Organic Cause?

WE ARE WORKING on a plan to enlist the aid of some of our readers who have the time to distribute our subscription-getting booklets and bring our message to an ever-widening circle. To those who are interested we will send a packet of 100 booklets. Each booklet contains a coupon and a means of identification so that when a subscription comes in we will know through whose efforts it was, and will pay a liberal commission for every such subscription.

You can give them out to friends who do gardening or farming. Perhaps some friendly seed store, or church will aid you, or a garden club.

Write for full details to Organic Gardening — Dept. Q, Emmaus, Pa.

The Real Basis of Public Health

By SIR ALBERT HOWARD, C.I.E.

From a lecture given before the Home Counties Branch of Medical Officers of Health

Woodland Humus

WHAT is a fertile soil and what produces fertility in a soil? The answer is: the quality of the humus it contains. What is this humus on which so much depends? Humus is a very wide term covering material ranging from peat in a bog to the sweet-smelling leaf mould found on the ground in a mixed wood. To secure a fertile soil we must furnish it with abundant supplies of humus of a quality as near as possible to the best leaf mould. We can most easily understand the nature of humus and how to make it in a garden if we observe how it arises by natural means. Humus formation is particularly active in any wood during the late spring and summer. If we examine the litter under the trees, we shall find that this material is made up of two constituents: (1) all kinds of vegetable wastes such as dead leaves, fragments of bark, twigs, and so forth from the trees and undergrowth; and (2) animal waste provided by the extensive animal population, many of which are minute, which lives in every wood. There is much more vegetable waste than animal waste — the proportions are at least four vegetable to one animal. The point to remember is that both classes are thoroughly mixed, kept moist by rain, and lightly packed so that ample access to air is easy. Soon a transformation begins. Moulds appear which begin to rot the wastes. The moulds are succeeded by bacteria, and soon the mixed wastes are changed into dark, sweet-smelling leaf mould. Humus has been synthesised. It is made up of the undecayed portions of the mixed wastes and the remains of the moulds and microbes which have fermented these wastes. But the leaf mould does not remain long on the ground. It is distributed throughout the top soil by Nature's manure distributors, of which the earthworm is the chief. The roots of the trees and undergrowth then make use of the humus for growth. In this way the wood manures itself. It first converts its wastes into valuable humus, distributes this humus by means of its unpaid labour force, and then uses the humus for growth.

There is one method by which Nature uses this humus for the nutrition of plants which will interest the medical profession now that the use of penicillin and penicillin-like substances has become so universal. The soil humus and the living cells of the active roots are connected up by means of certain fungi, the mycelium of which invades the roots and lives in symbiotic relationship therewith. This partnership is known as the mycorrhizal association. Eventually the fungous threads, which are rich in protein, are digested by the roots, when the soluble products pass into the sap and are carried to the green leaves, where they are used in building up fresh protein. It is only when this absorption of the digestion products of proteins takes place in the soil that the crops possess the full power of reproduction and resistance to disease as well as high quality. All these important properties are then passed on to the animal and to our-

selves. In this fungous-plant association I suggest we shall find the key to the public health system of tomorrow.

The Waste Products of London

We have seen how Nature in our woods makes use of her wastes to provide first the perfect manure and then the ideal manure distributors. How does the capital city of the Empire—London—manage these matters? Its waste products are destroyed, and fresh food has to be imported daily to keep the population alive. Moreover, the work of destroying the wastes of the city involves an enormous expense, which is recovered from the population in the shape of rates for paying salaries and wages and providing the gear for a work of pure destruction. We justify all this on the grounds of sanitation and the prevention of disease. But Nature does not worry about sanitation and disease prevention, for the simple reason that she converts her wastes into a valuable material in a perfectly healthy way. We can enjoy a summer holiday in a wood when her humus manufacture is in full swing and sleep on a ground sheet spread over a bit of her manure factory with perfect safety. Only a lunatic would ever think of camping out on one of the manure heaps of our farms and of spending the night on one of these evil-smelling abominations. I wonder how many of our city fathers and their staff, or of our farmers, have compared some of their activities with those of Nature.

Humus-Making

How can we make humus for our farms and gardens like that found in the wood? We cannot, of course, turn our farms and gardens into woods and work exactly as Nature does. But we can copy Nature by rolling up the fermenting carpet of litter and making it take much less room. If we arrange our mixed vegetable and animal wastes in layers one above the other and look after the ventilation and moisture supply of the heap, we can make excellent humus in three months in any garden or allotment. Full details of how to proceed in this composting process and how to use the humus to the best advantage are to be found in *The Compost Gardener* by F. C. King, and in the same author's *Gardening with Compost.*

Work in the Dominions and U.S.A.

The most spectacular progress in the work is being made in South Africa and in New Zealand. Southern Rhodesia for some years has published a return of the number of cubic yards of compost made annually on the farms. It is going up by leaps and bounds. The Union of South Africa has created a special department for converting the wastes of the towns and cities into compost for the benefit of the surrounding land. More than a hundred municipalities are now converting all their wastes, including the night soil, into compost. New Zealand has a very flourishing Compost Club with its own publications and a membership which has long passed the 5,000 mark. The United States of America is going into these matters with a will, and will soon have at least 100,000 active members in the new movement.

Results of Good Compost

Once we convert the wastes of a garden, a farm or of a municipality into humus in the form of compost and return this to the land, the results on the crops are instant and immediate. Soon diseases begin to disappear of their own accord without any assistance from fungicides, insecticides, and germicides. The crop soon becomes immune to pests. The really healthy plants protect themselves. This is a most important point which anyone who has a garden or allotment can verify for himself or herself. Make compost properly and then grow crops like lettuces, radishes, or potatoes in soil enriched with humus. Good yields of high-quality produce, resistant to disease and of good keep-

ing power, follow. Similar results are obtained on a farm in the growing of the grain, fodder, and forage needed by the livestock. The animals soon possess the bloom of health. The milk and meat they produce is also of the highest quality. When the produce of a fertile garden and a fertile farm is used for feeding the human population, robust health is the result.

If a fertile soil is the basis of healthy crops, healthy livestock, and healthy human beings, there must be some simple principle underlying all this. It is to be found in the condition of the proteins, which are the real regulators of infection. As is well known, the protein molecule is a very large one and is therefore liable to injury. Once it is weakened either through imperfect synthesis in the green leaf or by adverse climatic conditions, it is unable to withstand the attacks of parasites. Disease results. However, by seeing to it that the proteins formed in the plant are properly prepared, we can prevent much present-day disease at the source. We shall never abolish disease altogether, because some of this disease is due to the action of extreme climatic conditions.

The Effect of Herbicides on Soil Microbes

DURING THE COLUMBUS MEETING of the *Soil Science Society*, three scientists, Smith, Dawson, and Wenzel, presented a paper about the influence of weed-killers on the fungi, actinomycetes, protozoa, and nitrifying bacteria of the soil. They found that Ammonium sulfamate, biuret, sodium arsenite, and sodium borate (borax) did not reduce the number of organisms in the soil they investigated. 2-4-D did not reduce the fungi, actinomycetes and protozoa, but the nitrogen-fixers, nitrosomonas and nitrobacter were greatly decreased. Sodium thiocyanate was very poisonous all around, and sodium chlorate nearly wiped out the nitrifiers. This shows how right J. I. Rodale is in his constant warnings that chemicals may kill off the lower organisms in the soil, especially the beneficial bacteria. It seems that the nitrogen-fixing bacteria are first affected when a poisonous substance is added to the soil. It is well known that some fertilizers, like urea, can be, and have been, used for killing weed seeds and bacteria. That ammonium sulphate, a common fertilizer, kills off earthworms is also wellknown to readers of *Pay Dirt*. The fact that some chemicals were under the given experimental conditions not so harmful does, of course, not mean that *under different conditions* and *in higher concentrations* they would not kill off the beneficial life of the soil. We have therefore said: Herbicides may be used on paths and driveways, but not in the garden.

"By touch of Earth is our Strength Renewed"

Health for man and plants through Organic Gardening in Florida

By PAUL PFUND

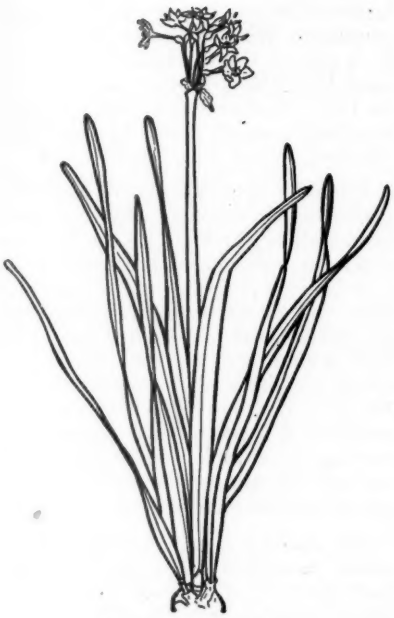
UNCONSCIOUSLY in the last fifteen years I have been developing a seeming almost reverence for the soil. The vast intricacy of it's so called population, and its functioning fascinates me. Seemingly too many of us have a very half-hearted attitude toward the soil. Indeed to the extent that we seem to think it irrelevant and unimportant as to how we treat it. We plow or spade when too wet, or we subject it to another harsh treatment by permitting it to be unduly exposed to sun and winds by failing to provide mulching or a growing cover crop.

I like to think of soil as an organic entity. Appreciated in this light I believe our attitude toward it would be one of due consideration. Two of my several chemist friends stress the fact that soil contains every element necessary for the well being of man and beast. As we have come to know recently Penicillin is one of its precious elements, and even more recently Streptomiasin still another element found to be mighty effective in the art of healing. These might be termed segregations in the light of multitudinous elements which soil contains and lends to food for sustenance of humans and all other flesh. I say lends, for under the law of return, all elements sooner or later return to the soil. That is nature's way of keeping a balance.

Volumes have been written and undoubtedly more will follow about means of acquiring and maintaining a state of physical well being. What I am stating is therefore not new but I believe fundamentals bear reiteration.

Back in 1929 after a long series of special treatments, by better-half had reached a stage of arthritis where the family doctor urged a change of climate. Florida he said was the place to go. We did go. (Now lest anyone should misconstrue what I am here stating to mean that I have land for sale in Florida or that I have connections with a promotional scheme, be calmed, I have neither). After having made a very careful survey of the state as a whole, and of course paying a visit to Ponce de Leon's Fountain of Youth, we settled down on our chosen site to the business of retrieving our health, for we were both in need of renewed life. There was only one way to satisfy my philosophy and that was to become ardently engaged in my chosen field, "Horticulture", growing lovely plants in our newly adopted state, Florida.

We decided to specialize in the commercial production of flowering bulbs. Even after a very careful choice of location and type of soil best suited for the purpose, we found that this very soil, as most others in the state and elsewhere, was in dire need of organics. We were advised by those who should know professionally that it would be necessary to use so-called commercial or synthetic fertilizers. This being contrary to my philosophy I ignored the advice and proceeded to plow in such weeds, dead or alive, which were present, and planted cover



Paperwhite Narcissus

crops. I was warned that plowing-in of green cover crops would "sour" the soil. I also ignored this, and further proceed on the principal that what the soil could produce it was also able to digest. The law of return. The proper interval of time was of course allowed for decomposition. All this was on land which had been subjected to "shot in the arm methods" of synthetic fertilizing.

This had gone on for years and years until the soil had become almost inert. Weeds had been burned repeatedly. The forebodings I was given if I tried any other method of soil culture were grave indeed. I am fully aware that we were cautioned in sincerity, for the congeniality of the natives as we found them combined with a very lovely climate was and is indeed highly conducive to the healing of body and soul. What with the air filled with glorious sunshine and laden with the rare fragrance of Orange and Jasmine blossoms. The tall Carabean Pines nodding understandingly to the Palms beneath and all nature being kissed by romantic breezes, Ah, this is indeed a delight to the eye and an inspiration to the soul. The very elixir of life. In four years I never wore a hat summer nor winter.

After a few seasons of soil culture in accordance with nature's own order we began to see astounding results. From a small beginning our stock had increased to well over a million choice bulbs. Not only was the increase noteworthy but the plants were practically disease free to the amazement of the entomologist. Of course we grew vegetables for our table and some surplus for market. We had eggplants four to five feet tall with the most luscious fruit in great abundance and of choicest quality. Our friends declared they had never seen the like. Choice Portorican red sweet potatoes were also grown, but "tops" were some onions. One season we had a surplus area of about one-third acre which was not needed for our regular bulb crop. We planted this to Prizetaker and Yellow and White Bermuda onions, having grown the sets in seed beds, transplanting to the field.

First I had made special inquiry of those who are paid for knowing and was promptly advised that onion production was not a success in those parts and therefore not to be undertaken. This was too negative for my blood so we proceeded without precedent. The results were astounding to all comers. A crop of over four tons was the result. An inquiry to a large wholesale produce concern, and a sample sent, brought a representative almost clear across the state to see the spectacle. A purchase was promptly effected. Nothing like it had ever been seen in Florida by this representative although he had been handling onions for many years in tremendous aggregation. He urged us to drop everything to grow onions on contract and make a "million" dollars.

The point is this: Organic Gardening did the trick notwithstanding con-

trary advice given by experts. Dr. Charles Northern of Tampa, Florida, one of the world's foremost "soil doctors" and strong advocate of Colloidal Phosphate (minerals) a natural unprocessed Florida product, says, "Soil is not just dirt". How profoundly true that is. I am afraid however, that is what we make it thru the use of synthetic chemical fertilizers, especially if persisted in indefinitely.

Simultaneously with all this our health improved markedly. The vigor of youth was returning. We were constantly afforded abundant opportunity to closely observe nature. We endeavored to work in harmony with her.

"Nature is the most thrifty thing in the world; she never wastes anything; she undergoes change, but there's no annihilation—the essence remains."
Quotation from Thomas Binney.

Our abode was in a most beautiful setting of large orange, walnut, pecan, palm and magnolia trees. There were also bearing fig trees from which the robins and mockingbirds would gather their breakfast fruit. Many varieties of lilies and some poinsettias also adorned the garden with a back-drop of bamboos and gorgeous Live Oaks. Yes all these and more are possible in the same garden in the "Sunshine State".

To one side of the sweet orange grove stood a native sour orange tree. It had been considered as of no value except for beauty. The fruit was taboo. We decided to make an experiment by using the oranges therefrom in place of lemons. The result was excellent for we discovered an incomparable flavor and a quality lacking in lemons. We of course picked tree-ripened fruit but the astounding thing was that this tree had no care and yet was far more thrifty than the cultivated sweet fruited trees. I found that no fertilizer was ever applied and that weeds and grass were thrown about under the tree for disposition. This obviously provided the needed mulching which in turn provided humus resulting in a perfectly natural condition. What a tonic good earth is. It is indeed the sustainer of all physical life. How dare we mistreat it. So here stood this flourishing orange tree with no spraying, no synthetic fertilizer.

I wonder sometimes if we might be getting away unconsciously from first principals. I think we need a reorientation in agricultural practices. I do not believe purely academic discussions will get us to where we want to go. Nature will do wonders if we give here a chance. Thru the use of synthetic fertilizers we have perhaps arrested if not destroyed much of our soil life. A further "shot in the arm" method of applying more synthetics will not, in my humble opinion solve any of our problems.

My chemist friends to whom I referred previously, profound thinkers, and who have developed a spray material made entirely of organics, perfectly harmless to soil and plants, which I am using,—tell me that while synthetic fertilizer stems from organics it becomes inorganic in the processing and the soil is powerless to reconvert it into organics. Thus it remains, in the final analysis a hindrance to the bacterial and microbial life of the soil.

In a report "Current Thinking on Nutrition", to the readers of "The Land" a journal published by "Friends of The Land", Dr. Jonathan Forman B.A. M.D. F.A.C.A. Editor of "The Ohio State Medical Journal" says in part,—"Poor land makes poor people, poor people make poor land, the people get poorer and the soil gets still poorer". And again — "Our health is primarily dependent upon our nutrition; the quality of our food is likewise dependent upon the soil in which it is grown; the fertility of the soil and its nutritive qualities depend upon the amount of organic matter and essential minerals which the soil contains."

Come with me along nature's way.

Garden Calendar—May

North Temperate Zone: May is the month with the last frosts. Pole Beans, cucumbers and all other plants of the family, such as melons, squash, pumpkin, are set out. Provide for protection during cool nights by hotcaps or paper milk containers. Tomatoes and peppers may be transplanted into the open. If you want to grow some tobacco, you may now sow it into the open or transplant seedlings. Corn goes out, sunflowers too if you have not already given them an earlier start. Lovers of millet sow it now and we recommend Golden or German millet. You can always use it for bird food if you do not relish its slightly bitter taste and long cooking time.

All of the above crops are moisture lovers and heavy feeders. You may put compost right into the planting holes and apply mulches on top. Watch out for the insect pests on tomatoes and cucumbers, pick them off early.

Sow some more lettuce, radishes, cabbages into the open. Transplant cabbages, cauliflower, and the delicious white or blue kohlrabi so good for raw eating. Watch out for cutworms especially with transplants. Sow summer radishes. In late May sow tampala, broccoli, and endive.

Time to put out gladiolus, montbretia (botanically named Tritonia), and all the annuals, especially of the composite family, such as zinnias, marigolds, but also portulaca, petunia, poppies, arctotis, bachelor buttons, etc.

By the end of the month you can take out the Amaryllis, fuchsias, and other house plants, including cacti.

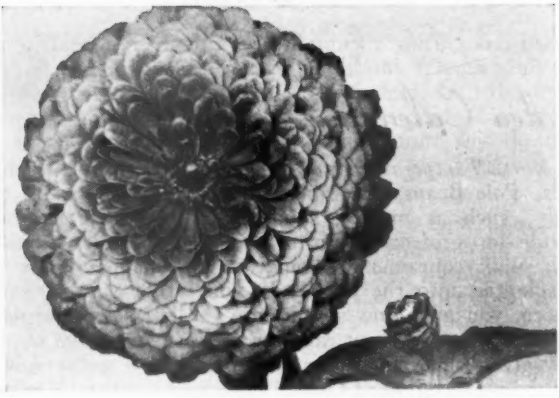
Disbud some of the perennials if you want showy flowers, divide Hellebore and primulas after their blooming period.

WEEDING TIME—it is easier to pull out the small weeds now than later when they have made great root growth.

If you want to try sesame for seeds or for appearance, this is the month to sow them.

Southern region: Vegetables for fall crops. Flowers for the hot summer months. Keep up the zinnias, petunias, gaillardias, cosmos, ageratum, portulaca, etc. Ageratum has many fine varieties, but can also be propagated from roots. Seeds had best be started in a pot or flat. Watch out for ants that they do not carry away the portulaca seeds of which they are very fond. You may also start new vines for the porches, try some of the decorative gourds which will delight the children and help the wife in mending socks.

Old Saying: The elderberry bloom indicates what kind of grapes you will have, few or many.



Burpee's Super-Giant Zinnia

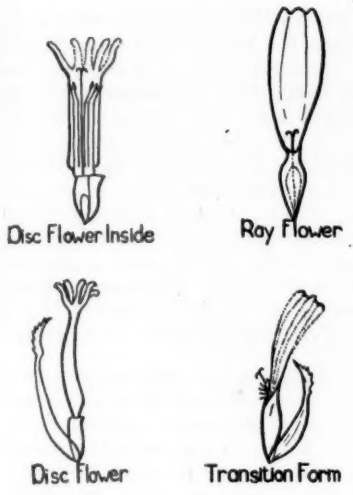
Old Fashioned Flowers

By DORIS CLARK

THE ZINNIA

ACCORDING to the records of the seed houses, the zinnia is the most popular of all the annuals, the best-seller among the plants. This is not astonishing, for it is a sturdy plant that thrives during the frost-free season on all kinds of soils from the Gulf coast to the Canadian border and beyond. It is a quick grower, can easily be started inside and transplanted for an earlier bloom, but will under average conditions produce plentiful bloom when sown right out into the open by the end of April. The flower heads vary in shape and color the plants differ in growth habit from dwarf to giant, and the normal flowering season spreads over many months, giving ample material for gay decoration on porches and mantlepiece. And yet . . . I had a certain prejudice against zinnias, because they seemed to me a bit coarse. I have overcome that prejudice as I became better acquainted with this interesting flower, and that is what I want to tell about. For there is no cultural problem that needs discussing, nor is there any sense in describing the different types which every catalogue amply pictures and justly praises. I shall tell of my personal acquaintance with zinnias.

At one time, I lived in a duplex in a Southern city, built on the ample plans of the South; each house had a considerable strip of lawn in front and a sizeable backyard. The renters of the lower apartment more or less took care of the yard problems. As a rule, that amounted to little more than a friendly chat with the colored yardman whom the owners sent regularly around every two weeks for the periodic lawn cutting. Then a new tenant moved in, an elderly distinguished-looking gentleman with twinkling eyes. Curious as I was in my younger years (and for truth's sake I must admit that I haven't grown much

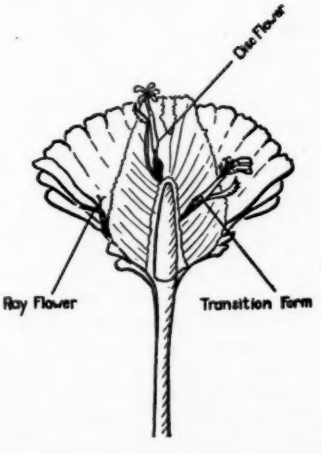


older in this respect), I glanced into the windows of the new renter as I passed along the driveway. The walls were covered with mahogany book cases, filled with hundreds and perhaps thousands of books. And, to my surprise, I saw a spade, a rake, and a sprinkling can right in front of a beautiful sideboard.

It did not take long until the new tenant put them to use. He dug up a considerable piece of the front lawn and started sowing and planting. The negro yardman always liked him for it, I think. My mother was a bit upset by these doings, since she liked to sit out on the upstairs porch and take in the evening coolness. A dug-up lawn is always a bit unsightly until new growth has started. It did not take long for that. By the end of spring, the bed was covered with flowers of all descriptions, but predominantly with zinnias. Looking at it from the upstairs porch, this gaily bedecked piece of front yard was a feast for the eye. Every day, when I walked or rode home from school I was looking forward to that colorful picture. It was many a times that passers-by stopped to admire the bed. The gardener below was usually out in the morning, turning on the faucet at the house and starting his irrigation. He puttered around, transplanted, and added, and altered the bed or his irrigation channels. It was always a nice picture.

The gardener, whose name was Robert O. Barlow, soon succumbed to my admiring comments and presented me with a bouquet of zinnias. I was not hesitant to accept them gratefully, but he insisted that I was doing him a favor. "The more I cut them," he said, "the more new flowers will come forward." As we became better acquainted, he explained to me the botanical relations of the zinnia and the principle on which a zinnia operated. As soon as I understood them, I also began to admire them. For, as Mr. Barlow said: "These zinnias are extremely clever. They could teach us humans many a good lesson."

Look at the flowering head. It is composed of dozens of little flowers collected in one basket. This is why the zinnia is said to be one of the "Composites", just as the sunflower, the marigold, the gaillardia, coreopsis, and a few hundred others, including the dahlia and the aster. Most plants overcame the handicap of solitary blossoms. Of course, those which have only one flower during an entire season have a great handicap; if this flower is not pollinated, there will be no seed, which might mean the end of this flower. That is why plants which



produce only one flower usually keep that flower going for a long time. Many more flowers have a different device; one flower opens after another, as can most easily be seen on the lovely portulacas or the domineering hollyhock. If one flower remains infertile, others will attract a visiting moth or bee; in the end, the flowering will not have been in vain. But the composites have gone even further. They assembled all the flowers into one head. And one flower after another matures, or, I should rather say, one circle of flowers after the other gets ready for a visiting moth. It is a beautiful sight, indeed, to watch these happy visitors appear at all hours of the day and sink their unerring proboscis down into the deep chalice where nectar awaits them. In this way they manage to get covered with pollen which they will then transfer to another flower or flower head. They graze the nectar quite systematically, or, as I should put it, they siphon out one chalice after another. Thus, most flowers become fertilized.

Look at the different velvety starlets on top of those zinnias, how they appear between the gloriously colored petals in white and maroon, yellow and rose, different in shape, but all serving their purpose. The zinnia has such reproductive organs in every petal, and when, later in the season, you break off a dried flower head and pluck it apart, you will notice that at the bottom of every petal a seed is hanging, some triangular in shape, most of them like an oldfashioned whetstone or the cross-section of a lense, rather attractive to touch and sight. It is amazing how these relatively small whisps of seed can give origin of such sturdy plants, reaching, in good rich soil, a height of three or four feet and producing flowers throughout the season. For that is an other clever design of the zinnia: While she keeps each flowerhead open for a long time, she also produces many such flowering heads. There is little chance that a species of the composite family will die out. They are among the most fertile of plants.

When we look at the human race and its social life or strife, its constant struggling for superiority, its constant wars and destructions, the solution of the zinnia seems very admirable: It need not fight, it has solved its problems; it has a splendid social system, in which each individual flower is given the best possible chance for successful survival and utmost security. For a composite flower is not an individual so much as it is a society or community of individuals.

As I began to understand these things, I ceased to look at the zinnia as a gaudy and coarse individual. In fact, I began to feel that this proud display of shapes and colors on sturdy stems was quite in order, because it was in keeping with the individuality of the plant. But watch them in the morning and in the evening, see them respond to the light and see them glisten under a fine mist sent out by the nozzle of your hose, and I think you will notice that—with all its great vitality and push—the zinnia is a lovable being.

Chrysanthemum-flowered Zinnia Burpee

Hints for the Vegetable Gardener

By ROGER W. SMITH

POPCORN

EVERY good vegetable garden should not only have value, it should provide some element of surprise and entertainment. Popcorn, a peculiarly American product, is grown in gardens throughout the country largely because of its entertainment value. Popcorn popping is a gay, national pastime.

Popcorn seems always to have been associated with gayety. It is the gardener entertainment. More than likely you will connect it with amusement parks and circuses and elephants. Popcorn might be thought of as the frivolous sister of sweet corn; it has always held an important place in mens' hearts as well as their diets.

Popcorn seed and primitive earthenware poppers have been discovered in the prehistoric Indian remains in South America. Popcorn was used by various tribes in both North and South America long before the discovery of America by Columbus.

That these people appreciated the gay touch we associate with popcorn is shown very clearly in the reports of early Spanish explorers several of whom, in describing the elaborate harvest festivals of the natives, mention ceremonials connected with popcorn. These reports often mention ceremonial dances performed at dawn by the most beautiful girls of the tribe who wore crowns of popped maize resembling crowns of orange blossoms; around their smooth shoulders were draped multiple strings of the same colorful kernels like chains of flowers.

When you hold a little popping party in honor of your garden, using the popcorn you have yourself grown, harvested and stored, your thoughts may take either of two directions. You may wonder why popcorn pops or you may be inveigled into speculating about its long history and wondering about its actual food value.

Many flint corns will pop quite well, as will some sorghum seed with a dense, flinty structure. Even among popcorn types there is a wide difference in popping quality. The ability to pop depends upon the extent of the horny coating of the seed which confines the moisture-holding, starchy substances within until the steam pressure generated by the heat applied causes the seed to explode.

Over-moist popcorn will not pop properly, neither will newly harvested popcorn. To insure the best popping quality, the ears should be husked and stored in a dry, well ventilated place until all excess moisture is removed. Early grown popcorn is usually ready for popping by Christmas or even as early as Thanksgiving.

If the kernels have dried out excessively during curing they should be removed from the cobs, slightly dampened, and held in airtight containers for a day or two. But in these matters you will not find too much difficulty; like the actual popping, which requires some skill, ability to cure and prepare the popcorn improves with practice.

To go further into the matter of popping corn would inevitably lead us into the field of commercially popped breakfast foods and the like. It would bring us from an account of how the popping of a little specially grown corn by the ancient American Indians can develop into a major industry.

Having settled briefly the reason why popcorn pops, what of its importance as a simple article of diet? This brings up an interesting and peculiar element, just how valuable is the fact that the whole grain of the popcorn can be made so easily available for human consumption?

As you know, most grains have to be milled or at least pounded in crude pestal and mortar, made into a rough flour, and later cooked into a cake. Popcorn, however, has that delightful quality, that gay irresponsibility if you like, that such things are not necessary for its use. In what way does this give it value?

As an example: before the present war the growing of popcorn in Holland was much encouraged because it was realized that popped corn could become an important emergency article of diet without milling. Doubtless many peoples ancient and modern, under the stress of war or other national difficulty, have found in popcorn a means of keeping body and soul together, simply because popcorn was so easily prepared.

The parching and roasting of grains was common practice with many Indian tribes. In the popping of a specially growth type of corn, this practice reached its highest form. In the use of popcorn in Holland we see clearly how these almost forgotten methods helped a modern people.

As you might have supposed, the popcorn plant is much hardied than sweet corn. The seed may be sown a week earlier. But the ground should be properly prepared and well dug. If an inch of good compost humus is dug in over the area where the popcorn is to grow, this will do much to enrich and improve the soil.

You will find it best to grow the popcorn in a rectangular planting, as with all corn, to ensure pollination. The area should be well drained and open to full sunlight. If your supply of compost humus is short, popcorn will thrive on an application of rough compost materials left over after the sifted material has been removed and used for less rugged plants.

Five or six seeds should be sown in hills three feet apart each way and covered with about one inch and a half of fine topsoil. The plants should later be thinned to four plants to the hill. One good packet of seed should provide enough plants and more than enough popcorn for several popping parties.

You will be able to make your selection from several types of popcorn. Many regions have special types developed locally; these are interesting and often of much importance in their own territory. Very popular over wide areas are: South American Mushroom—120 days to maturity—a large, golden-yellow variety which when popped becomes creamy white, and White Rice—110 days to maturity—which has long been a favorite with the popcorn trade.

Whichever variety you select you will naturally make your selection to fit local conditions; you will discover first just which variety is best suited to your vicinity.

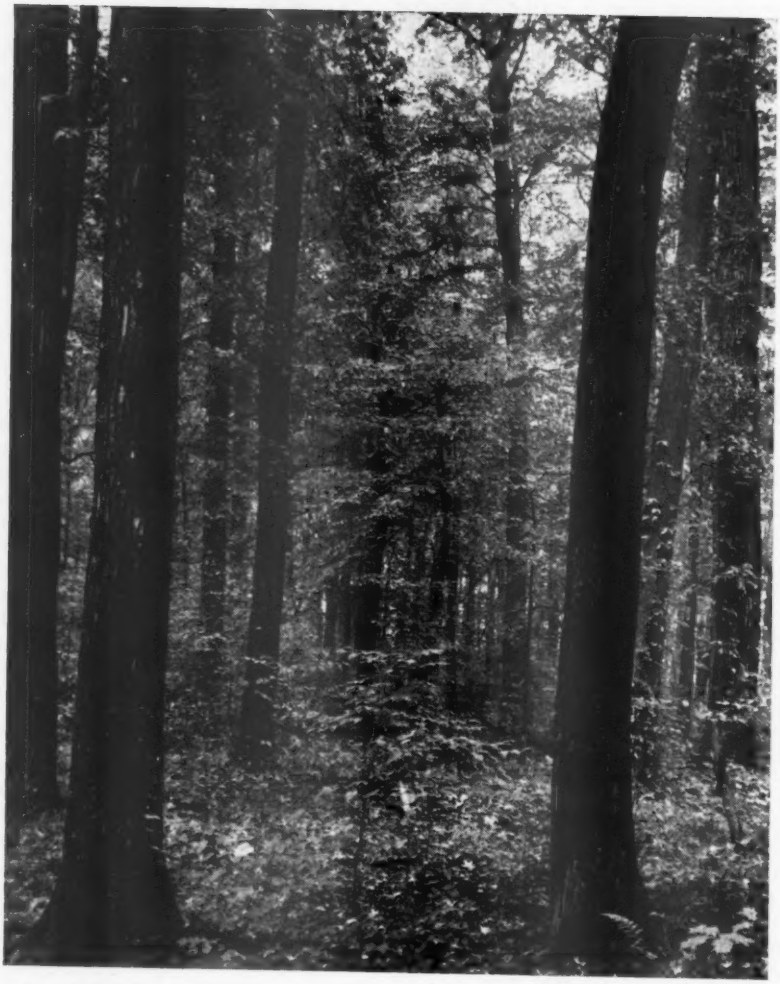
The important thing to remember is that the soil must be fertile, that it must contain an ample supply of organic humus. This point is even more important with popcorn than with field corn because popcorn is judged by its quality rather than its quantity. You will appreciate this fact more strongly when you note how small the ears are.

The cultivation of popcorn is about the same as sweet corn, at least there should be enough of it to keep down weeds.

You probably won't have room in your garden for many rows of popcorn —maybe only a small square. Later, with a wire popper, before an open fireplace, you may decide that that little square was well worth while. The fire light. The children's bright faces. Popcorn may be an unimportant crop. But in the laughter of the children's voices you catch an echo of the gayety that has ever been associated with this fine plant.

Madison On Compost

PRESIDENT James Madison, on May 12th, 1818, in an address to the Agricultural Society of Albemarle, Virginia, stated: "Closely as agriculture and civilization are allied, they do not keep pace with each other. There is probably a much higher state of agriculture in China and Japan than in many other countries far more advanced in the improvements of civilized life. Nothing is more certain than that continual cropping without manure deprives the soil of its fertility. It is equally certain that fertility may be preserved or restored by giving to the earth animal or vegetable manure equivalent to the matter taken from it. That restoration to the earth of all that naturally grows on it prevents its impoverishment is sufficiently seen in our forests, where the annual exuviae of the trees and plants replace the fertility of which they deprived the earth. Where frequent fires destroy the leaves and whatever else is annually dropped on the earth, it is well known that land becomes poorer, this destruction of the natural crop having the same impoverished effect as removal of a cultivated crop. A still stronger proof that a natural restoration to the earth of all its annual produce will perpetuate its productiveness is seen where our fields are left uncultivated and unpastured. In this case the soil, receiving from the decay of the spontaneous weeds and grasses more fertility than they extract from it, is, for the time being, improved. Its improvement may be explained by the fertilizing matter which the weeds and grasses derive from the water and atmosphere, which forms a net gain to the earth. That individual farms do lose their fertility in proportion as crops are taken from them and return of manure neglected is a fact not likely to be questioned. The most logical mode of preserving the richness and of enriching a farm is certainly that of applying a sufficiency of manure and vegetable matter in a decomposed state; in order to procure which too much care cannot be observed in saving every material furnished by the farm. This resource was among the earliest discoveries of man living by agriculture; and a proper use of it has been made a test of good husbandry in all countries, ancient and modern, where its principle and profits have been studied."



Virgin Hardwoods in Indiana

U. S. Soil Conservation Service

Annuals, Biennials, Perennials

By HEINRICH MEYER

NO distinction is more important to the gardener and the farmer than the distinction between the growth cycles of plants. An annual, strictly speaking, is a plant that grows from seed in one year and produces seed the same year. A biennial is a plant that makes a vegetative growth during the first year and flowers the year afterward. A perennial is a plant that may flower the first year or the tenth year or even later, but that will continue its existence after flowering and seeding. To make this obvious matter a bit more impressive and to show the real problem that is hidden in it, as in all obvious things, let us make an application to ourselves. If a newborn baby would reach full maturity within a year and die after it has produced offspring, it would be an annual. Annuals are plants that produce offspring only once, whereas perennials are like most animals—they don't die as soon as they have perpetuated the species; they keep on living as individuals to produce progeny again and again.

We look at annuals as freely flowering and are constantly amazed at the display of blossoms in zinnias and clarkias, larkspurs and portulaca, petunias and snapdragons, ageratum and bachelor's buttons. But these flowers do not flower for our benefit, they flower for their own good, because they want to produce seed to survive in seed form, since they cannot survive as individuals like the oak or the perennial rye grass, the tulip or the dahlia. They have but one year to take care that they may not become extinguished and must therefore make the best of it and produce as many flowers as possible. That is why annuals are such profuse bloomers.

The comparison with tulips, dahlias, perennial grasses and solid trees was deliberate. For these plants have developed systems that allow the perpetuation of the individual. The tulip rests securely in her bulb, to blossom forth year after year. It need not worry, as it were; it need not hurry. It need not exert itself producing hundreds of flowers; there will be another spring and not all the energy must be spent, some must be saved for personal survival. The oak takes its time before it is ready to bloom; it establishes itself firmly, builds up trunk and reserve food materials, develops branches and reaches a certain height, before it is ready for flowering and seeding. And, like all other trees, like most tuberous and bulbous plants, it survives its flowering; it continues after it has shed offspring.

All life is purposeful; just as we humans cannot but do some planning, however futile and stupid it may turn out at times, just so do all other living beings follow a sensible course or a direction. It is not sound to say that plants have a will or act intelligently, but they certainly act with an innate, if unconscious, wisdom that is to their own good. Plants are in that respect considerably wiser than humans. If now we compare the different types of plant growth we find an almost infinite variety of purposeful solutions—from trees that live as individuals for

The Virgin Hardwoods make such a luscious growth that you'd think such soil would support almost any other crop besides trees. Nothing doing. "When cleared of tree growth and cultivated, the finer soil particles filter down to plow depth creating a hardpan which prevents all movement of soil water." Why is this? This forest grows on a certain silt loam soil which drains poorly and is usually found on level land. Such land should be maintained in woods.

thousands of years, giving rise to uncounted numbers of offspring, to annual flowers that produce equally many thousands of descendants within one year. Other plants, especially the bulbous ones, are more thrifty, though the lilies and some of the corm storers, like the gladiolus, not only arrange for plenty of seeds, but also numerous individual offsets, bulblets, etc. So do the grasses, which perpetuate themselves not only by seed, but also as individuals by runners, not different in fact from the trees which send off new individuals, especially when the old tree is cut down to a stub. In the human race and in human history, no comparisons are available for such a variety of self-perpetuation and reproduction. Nor can we plot a course for ourselves by looking at the course the plants have taken. Is plant growth tending toward the preservation of the individual, long lives, perennial growth habits or do the plants as a group disregard individualism and are satisfied if merely the species continues through seeds?

No definite answer is possible, since both tendencies are present. The composite family is a late development in plant history and, as a rule, the composites are profuse and quick seeders; but they have not forgotten the common plant heritage of personal survival by clever devices. Look at the Dahlias and their tubers which serve as a wonderful means of perpetuating the individual through years and during the seasons of adverse feeding. Or, as some mammals have developed a system of metabolism that allows them to pass the winter snugly resting in a cave, the Jerusalem artichoke, another composite, has succeeded in perpetuating itself almost entirely through its tubers. But the grasses, which are no youngsters in history, have in them an ability to produce seed profusely enough to feed all of us humans, mammals, and most of the birds, while keeping up their runners and other methods of individual survival. Grasses, though old, are yet among the most variable plants, always ready to come forth with a new design. Who would have thought that they even alternate occasionally between male and female? But that too has been observed, and some are even

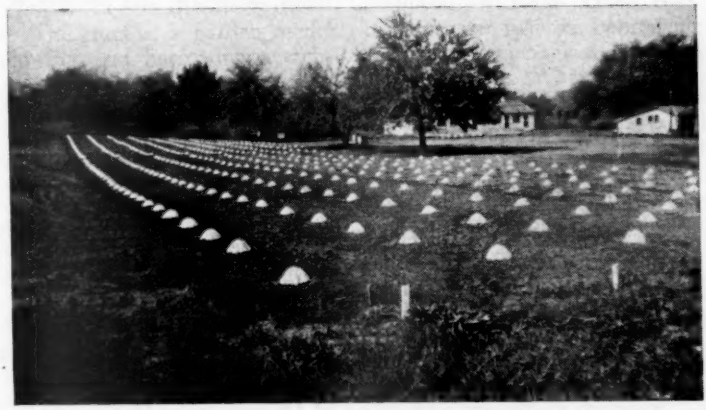
Mullein (Verbascum) Brooklyn Botanic Garden

The mullein is a very decorative plant with many species and varieties. Usually it has a biennial growth habit, sometimes it lives as a perennial.

ready to mate with grasses from entirely different genera. No race barrier there! It is quite obvious that they have no will and cannot set up arbitrary regulations for each other's behavior. For the same reason they need no army, no political organization, not even a police force. Everything is permitted and if a freak develops and survives, nobody among the plants seems to care. They are apt to outlast us humans by these techniques, too.

All of this is perhaps a bit too philosophical. But what is a gardener to do when he looks at a catalogue and sees annual and perennial centaurea, wallflower, linum, poppy, gypsophila, salvia, etc.? What is a farmer to do when he sees the prices of alfalfa and clover and rye? Should he plant a perennial like the costly alfalfa and take good care of it or should he grow an annual or biennial cover crop? The practical aspect will determine what he does. But suppose he is very greedy and cuts his alfalfa close to the ground . . . he won't have a very successful perennial. For the alfalfa pushes up young sprouts from the axils and makes up by these additional growths for our additional and quite unnatural cuttings and mowings. Cut lower and you lose the benefit of this additional growth. Cut higher and you benefit by the plant's desire to produce seed by all means. For these additional branches sent out are nothing less than attempts to produce flowers. And if you *pinch* your fuchsia and geraniums, your salpiglossis and a dozen others, ostensibly to produce a compact growth, you merely utilize the plant's innate desire to make up for a loss by growing more amply.

The gardener need not distinguish between true annuals, plants which live only for one year, and cultural annuals or plants "treated as annuals". The latter come from regions where milder winters made for a longer growing season. Some of the perennials of the tropics are annuals for us. If the weather should permit, they would survive longer. Biennials are, as a rule, adaptations to an inclement winter or summer. The difference between an annual and a biennial is much less strict than between annuals and perennials. This was found out when winter grains, biennials, were trained into summer grains or annuals. There are always quick growers among the slower ones and these can be selected, just as slow growers are found among the annuals. These then



Hot Caps — A. E. Crandall, Berlin, Conn.

A cultural means of extending the growing season and making the year longer for tender annual crops.

become biennials or even perennials. The hollyhocks we have in this country are such a doubtful race which comprises every kind from annuals to perennials. And among the Canterbury Bells and dianthus a similar variety exists.

And now when you consider which perennials you should put out, from now until the next snowing, look at the problem occasionally from the point of view of the plant. "Hardy" is a nice term that shows what the plant means to us and our gardening, but what does it mean to the plant? It means that a wise plan in nature prevails which has provided life with a possibility for survival, through a storage root, a solid trunk, a corm or a tuber. And then think perhaps that there might be a good many lessons we could learn from watching how wisely the plants husband their endowments for their own good and our enjoyment, for their propagation or continuation as a species and for their self-perpetuation as individuals.

We might almost call this "self-expression". There is a mechanistic view which explains everything in terms of 19th century usefulness. Birds, according to this view, have beautiful feathers to attract one another; flowers have varied colors to attract the insects and get pollinated. This view takes much for granted. To mention just one thing, do we know that the flies which creep down into one of the arums, attracted, as we say, by the odor, have any eye for the beautiful color of the flower? Why are the bees attracted just as much to the inconspicuous wind-pollinated tree flowers as to the showy blooms in the garden? And, if they did everything for practical purposes of our human description, why should the plants make such mistakes as having tubes which do not permit some insects to sink their probosces down? This whole theory of adaptation is quite doubtful, though it may help us off and on as a first entry into the problems. But consider the most obvious fact that most biennials and perennials are plants which do not just live for the perpetuation of the species, for the survival of the race, but plants which live for their own individual survival, not different from most animals with a will to live, and ponder if this is not what we would ordinarily call self-expression. There is definitely no collectivism among plants, but there is a strong group feeling and a gentle method of getting along with one another. Fullest self-expression without destroying anything—this exemplary plant behavior is, to my mind, best exemplified by the manifold varieties among annuals, biennials, and perennials.

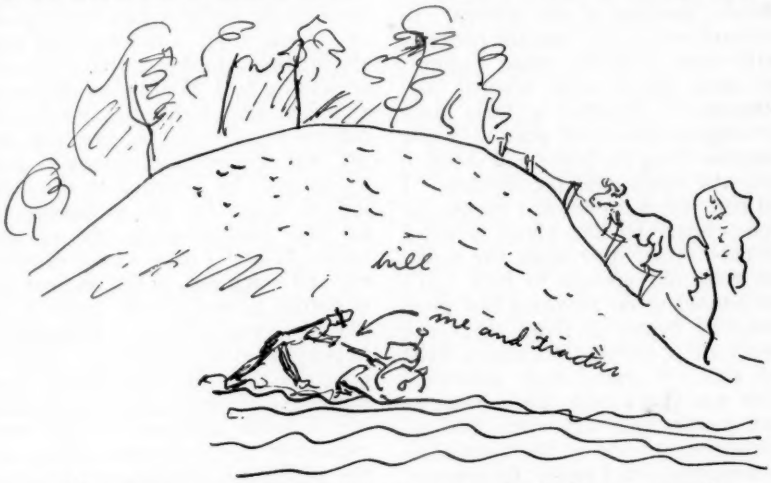
Plant Diseases and Malnutrition

WHEN RASPBERRIES or other cane fruit were lacking potash, which the organic gardener supplies in form of mulches, leaf mold, compost and wood ashes, they developed leaf scorch. At the Oregon station, experiments were conducted with various cane fruits that showed a considerable increase, not only in yield, but in the health of the plants when they were given a good potash diet, the scientific research of Powers and Wood of Oregon State College recently showed. And another recent report showed that thrips attacked only plants that were lacking in nitrogen.

My Garden

By BINGHAM SMALL

I STARTED with a garden 50 x 100 feet, that was five years ago, and since then it has expanded to a half acre. It all started one spring when I was out in the country where the family had three acres of cleared hilly land. The land was not being used for much of anything and when the grass grew high we would cut it back with the tractor. The tractor, a garden model with plowing and harrowing attachments, seemed made to order. I looked around, figuring where I would stake my plot, and that was not too hard for my choice was limited to finding a site that had the least slope. I finally chose a place on the north face of the hill, staking it out with the long side parallel with the hill's contour and planning to run my rows in the same direction. Afterwards I felt some kind of insight had led me to that particular choice of site, as the rows ideally ran east and west so as to receive full benefit of sunshine all day long. I hooked up the tractor and started turning the sod, rather I struggled to turn it for my ignorance of the art of plowing was as great as my ignorance of gardening. Anyone who doubts that plowing is an art should try it the first time on a hill-side. My equipment was not perfect—I had a 10 inch plow where a 6 inch was only necessary, a hill-side plow would have been better, and the tractor was too light. I did not attempt to plow



in a circular fashion, contenting myself with slicing back and forth in some sort of fashion. When it came to turning a furrow uphill, I was in hot water, for when it was up down it would slide again. It was bad practice, but I ended by turning my furrows all downhill. After the ground was broken I set in with the harrow and that was much easier.

I figured that, since I did not know much about it, that I had better concentrate on a few types of plants rather than many and had sent away to a mail-order seed house for bush-beans and sweet corn. But I was not ready yet as I did not know what to fertilize with nor how to use it when I got it. One day I walked into a

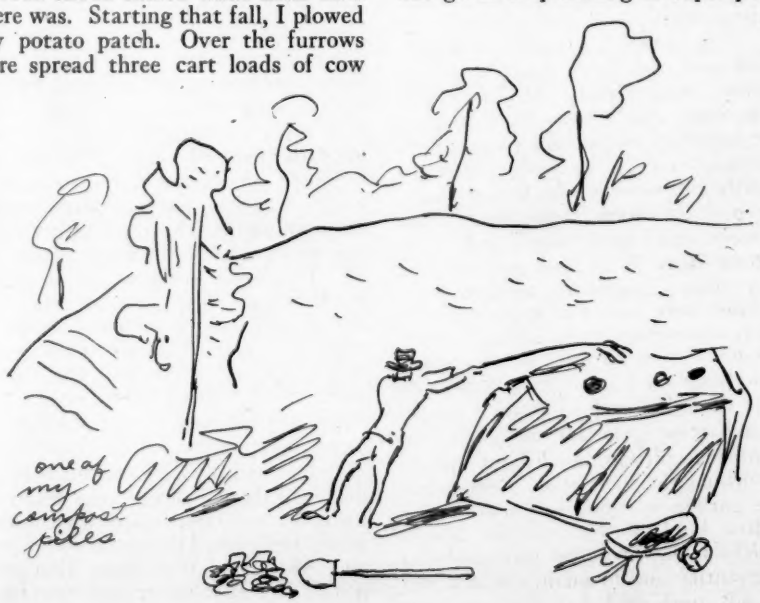
feed and seed store in town, asked about fertilizer, and left with a bag of what I later discovered was superphopshate. A friend of the family—he had been born on a farm—supplied the rest of the information when he suggested I make the planting furrow, plant the seeds and then pour the fertilizer over them. It didn't sound right and, instead, I took the precaution of mixing it with the soil before I planted. When the seeds came up, not all of them came, and some came up for the cut-worms. There were pronounced differences in size and general appearance of plants growing in different sections of the garden. In one part, where the ground had formerly been used for trash burning, the corn plants were stunted and yellowish. I departed a little from my original plan and planted a few tomatoes along the bottom of the plot, using the same stuff for fertilizer. I had had my warning, and by placing paper collars on the plants avoided the cut-worms. But when the tomatoes were old enough to bear fruits one refused to do anything but grow leaves. I began to think that each species of plant was a case in itself and that, in turn, each individual plant was also a case. There were no bean beetles that first year and no corn-ear worms and no hook worms on the tomatoes and I took it for granted. Cultivating, I did conscientously, being of the impression that the deeper you dug the more things would grow and that a weed was the beginning of a miniature crime wave. I suppose part of it was that I had discovered that growing something can be the most fascinating experience in the world and hoeing gave me an excuse to watch. My practice was to hill everything as high as I could as long as the soil held out and, though this was well when a torrential rain poured off the hill, I exposed a lot of sub-soil in the process. Perhaps it is too much to say that I was converted to gardening already and that the proof, in tasting really fresh vegetables, was merely an anti-climax.

The next few seasons saw me learning, slowly perhaps, through reading but mostly by experience, better practices. Hill land is not ideal land for gardening and my problems, first of all, had to do with conservation of soil and moisture, while at the same time allowing for good drainage. The soil, of a heavy red clay variety, was retentive enough of water but once the saturation point was reached it was 'hands off'. At the other extreme, during those dry summer months it would bake to brick-like hardness. Hilling the rows parallel with the hill's contour might provide for drainage but more of the soil's surface was exposed to sun and wind. I did not then know the organic principle—what was needed was humus. Manure in any quantity was out of the question for the hill was hard to get to, source of supply was distant, and means of haulage scarce. So I turned to the growing of covers for green manure and for the holding properties of their roots. At first I used winter covers of rye and vetch but, as the original area of garden grew gradually larger, I employed summer covers of lespedeza or buckwheat giving different portions of garden a rest. By that time I knew something of rotation, no longer thinking of beans and peas as just vegetables but also as legumes, along with the vetch and lespedeza. My tillage of the soil improved and the tractor became a useful tool once we both became adjusted to the conditions we had to work under. It was not necessary to bury your plow if you followed with thorough harrowing and cultivation by loosening the soil, not digging it. The list of vegetables grew much longer and I learned to think, for example, of cabbages, broccoli, and kale as belonging to the same large family whose peculiarities of growth could be generalized. It was curious the way things would go with the insect pests and the fungus diseases. There was the corn—and the ears were perfect the first two years but with the third came the ear worms and the ugly fungus disease, corn

smut. Other plants went the same way, especially the melons. The first three years everything went fine and the fruits were large and delicious, but after that the striped and spotted beetles made the life of the tender vines unbearable. Of course I dusted and sprayed but I could not help noticing, as with the melon vines, that after dusting with rotenone the leaves, as tender as melon leaves are, seemed to sicken and dry away. It was discouraging.

The summer of '44 there was a drought in this section. I remember reading an agricultural survey on the corn crop in Ohio, for that year, in which it was said that fertilization with manure had yielded an average crop while chemical fertilization had proved a disappointment. All things balancing, I determined that I would not be caught again with potato vines withering away, tomatoes with blossom-end rot, beans mere wisps, peas dying too soon and cucumbers and melons a failure in spite of copious watering. Pests of all kinds had increased, even the animal variety, for a wood-chuck raided what little corn there was. Starting that fall, I plowed my potato patch. Over the furrows were spread three cart loads of cow and horse droppings so painfully scavenged from the pasture next-door (after all, I had given the animals my corn stalks). This was harrowed in and the rows immediately laid out. As an inter-crop and to keep the rows from filling during the winter, vetch was planted between the rows. Other fall plowing included the preparation of an early garden for peas, spinach and other early vegetables. The furrows were left as they fell to prevent washing and no cover planted. The landslide was removed from the plow and the portion of garden for warm weather vegetables, as corn and beans, was gone over. This permitted a scoring of the soil, without too greatly disturbing the surface, and gave the rye and vetch cover sown a good hold.

I was set for winter and, at the end of February when it was not too wet or dry, I planted the potatoes. I had always used the chemical fertilizer recommended for the crop, but this time I thought I would experiment. There were three 100 foot rows—in the first twice as much of it was used as in the second, while half the last was given a sprinkling of super-phos-



phate, the remainder nothing. Between the rows the vetch was coming up and it was disturbed as little as possible when the rows were closed. In March onions, peas and early vegetables were planted, no harrowing being necessary as the rough furrows were nearly smooth through weathering. I had planted my first corn when I got my first copy of Organic Gardening. My conversion was immediate, not because there was anything novel or startling about it but, rather, because it so fitted into my own particular scheme. Already, I believed that the closest possible approach I could make to natural conditions was best. I had green materials in abundance—all I had to do was rake the hill-side and in time I would have my fertilizer problem, and a lot of other problems settled. Between June and this fall I built four compost heaps, though the organic supplement still had to come from the pasture next-door (I made it a point to give the animals the lower half of the corn-stalks, composting the upper half). But I am getting ahead of the story, for I still had bush beans, limas, and more corn to plant. Eliminating chemicals I planted the beans 'as is,' no compost available, and pondered over the corn. The vetch and potatoes were getting along fine with each other and I thought that corn and lespedeza might like each other's company too. Corn was planted in slightly ridged rows with lespedeza between, cultivation being kept clean between individual plants and right next to them. With both potatoes and corn these relationships worked wonderfully well, and the lespedeza and vetch inter-crops were left to flourish as long as possible. When the plants grew larger and cultivation had to be done directly between rows, I rigged up a harrow spike for the job. This permitted cultivating without unduly disturbing the roots of the inter-crops. The garden was not too neat to see, with a kind of wildness but also a healthy look. The corn produced ears in quantity and in quality which surpassed anything I had had since the earlier days. The potatoes were the best ever. My experiment with them, in the manner of fertilizing by rows, worked out in proportion: of six bushels dug in the patch three came from

the last row, two from the second and one from the first. The super-phosphate used in half the last row did not seem to make any difference as to either yield or quality when compared with the unfertilized half, and it was noticeable that the largest potatoes all came from this row. The greater quantity of chemical fertilizer used in the first row had a retarding effect on germination, the row neither coming up evenly or, in some places, at all. This same row bore the brunt of the beetle attacks, while the other two got by with an occasional hand-picking of the pests. The corn had not a single case of smut and ear worms were few. My earlier planting had been plagued with both, using phosphate for fertilizer. Lima beans produced plentifully and the bush beans did well, though flea beetles acted up badly—a soil replenished with humus would end that. The season was a good one, but I had the feeling that even if it hadn't been the results would still have been pretty good. With another

season coming, but this time with the organic principles firmly in mind and in full practice, I believe that even that ideal garden I have in the back of my head will come true. I have made a beginning this fall by conditioning my soil with the ripe humus of the first two early compost piles, and I became extremely earth-worm conscious when I was doing my fall plowing. Another year and I think I will carry this interesting business of plant relationship further, using different types of flowers and vegetables together. It will be an interesting and colorful experiment.

Setting out Plants

PRUNING VEGETABLES is a common practice in certain regions. The gardener pinches off certain parts of the leaves to reduce the area and the evaporation. Is this a good system? NO, *it is not.* The careful experiments made by J. E. Kraus and published as *Technical Bulletin* of the USDA, No. 829, August, 1942, show that as a rule the roots suffered from the reduction, that the plants were delayed from reaching maturity, and that the total yield was lower when they were pruned. Only small celery plants did not show any particular effect and some of the plants which make their major growth after setting out, such as peppers, could stand the treatment. But cauliflowers were among the crops that should not be maltreated when you want them to be in good shape. Before long, there will be advice to prick out parts of your tomatoes. The commercial growers do not follow this practice since they know that they get more tomatoes by letting the tomato grow as it wants. The leaves, after all, make the stuff that makes the tomatoes, and if you reduce the leaves, you reduce the crop.

Cropping and Organics

OVER TWO AND A HALF MILLION ACRES of Wisconsin land are organic soils. They are peat areas subject to late frosts, but nevertheless have been cropped. What happens to the organic matter in the soil when agricultural crops are intensively grown? This important question is answered by *A. R. Albert of the Wisconsin Station*: Organic soil resources are destroyed at the startling rate of a foot every thirty years. If the land is kept in grass, it will take about 125 years or longer until a foot is used up.—This shows not only that pastures and meadows are fine soil conservation measures, but more important yet that organic matter is used up. If crops did not utilize organics, there would be no depletion. Since there is a depletion it is absolutely essential to follow the organic system and to replenish the essential humus elements.

Compost Making At The Organic Farm — Cedric Morris

Heat In Composting

By OLIVER LAWRENCE

SOON after the formation of a properly built compost heap an intense fermentation sets in, with the heat reaching a temperature range between 150° F. and 160° F. To attain this heat, there must be an abundance of nitrogen and bacteria—for it is the microbial bacteria, smallest of plants, that generate most of the heat during the complex chemical process that breaks down the vegetable and animal wastes constituting the raw material in a compost heap. While heat itself contributes slightly to the decomposition, it is largely as a barometer reflecting the important bacterial action (in the presence of nitrogen) that we should evaluate the heat in composting. There is a close association between nitrogen (an integral of protein), bacteria and heat.

Bacteria, in common with all other plants, depend upon nitrogen for growth and carbo-hydrates for energy, with temperature playing a part in their development. Of many kinds and with varying preferences and tolerances, bacteria are inhibited by excessive heat or cold. Chemicals are among their greatest enemies. Compost provides a natural environment or culture medium for bacteria that take nitrogen directly from the air. Another group of nitrogen-gathering bacteria inhabit the roots of certain legumes. Bacteria use the ammonia, urea and other soluble nitrogenous compounds that abound in fresh manure to build up their own cells. Bacteria are identified with the important nitrogen cycle, but they themselves have a very short life cycle. As the supply of nitrogen becomes exhausted, the growth and activities of bacteria decline, heat diminishes, and eventually the bodies of the bacteria become valuable amendments to the compost.

The best sources of nitrogen are fresh animal and poultry manures and urine; dehydrated, commercially prepared manures (be sure these are not chemically processed); dried blood and animal offal; hoof and horn meal; and cottonseed meal.

During the first three weeks or so, the period of maximum heat in a compost heap, aeration is of vital importance—for it is the aerobic (oxygen-loving), thermophilic (heat-loving)

bacteria who play the major roll in the decomposition that reduces the material in the heap to about two-thirds of its original size. These bacteria are happiest in an environment of 148° F. to 180° F. If heat and shrinkage do not manifest themselves, something is wrong. Check aeration and moisture. Like all plants, bacteria need water—but a compost heap should not be allowed to become water-logged. A little ridge on the top of a heap and a light mulch of hay or straw will help to preserve moisture in dry weather. A thick layer of matted leaves, a blanket of ice, too much earth, or an insufficiency of ventilation holes, prevents proper aeration. While the pit method of making compost better insures heating, aeration in this is more difficult than in compost heaps.

Equally undesirable are too much heat and too much cold. Extreme heat destroys certain bacteria and nutrients. An example of this is in the grey-appearing "fire-fang", resulting from overly compacting of fresh manure, unredeemed by plant material such as hay or straw. Or if a compost heap is allowed to stand too long without turning, the inside becomes overheated. In the warm months, climate is working for the maker of compost, whereas in the cold months weather conditions retard compost making in certain areas. A two foot covering of hay or straw, and a well chosen site affording the compost heap a southern exposure and protection by a wall or hedge against the cold, drying northern winds, help to offset unfavorable circumstances of climate. On a dairy farm it is possible to save animal urine, and a pouring of urine into a compost heap is very helpful — especially in cold weather. A frequent cause of slow decomposition and lack of heat is due to failure to make the heap large enough. *Minimum* dimensions of a compost heap are: height 5 feet, width at base 6 feet, and length 6 feet. Greater size (except height) should be emphasized under adverse influences of climate.

At the time of the first turning of the heap (in about three weeks), the aerobic bacteria will have completed most of their work, and new operators or workers appear in the form of anaerobic bacteria, who live without air, and fungi that thrive in a heat range between 97° F. and 130° F. Aeration is no longer a problem. From here on a gradual downward trend of heat to around 80° F. or 85° F., for the finished compost, conforms with the optimum temperatures required by the organisms that break down the cellulose in the vegetable wastes. To each type of bactetria and fungi Nature allocates certain duties.

In compost making it is not necessary to employ a thermometer with which to measure heat in the heap. There are plenty of signs that tell a composter if proper decomposition and related heat are materializing. Copious steaming from ventilation holes has favorable implications, but there should be no ammonia fumes, as these denote loss of nitrogen. A poker thrust into a compost heap will feel warm to the touch if all is well during the important early phases of decomposition of the material.

Probably the best example of the importance of nitrogen and bacteria, and accompanying heat, in the making of compost evidences itself when leaves and other plant material are piled together to rot without nitrogenous activation. In such a situation, it may take two years before a breakdown is accomplished. Under the Indore process of compost making evolved from Nature by Sir Albert Howard, and advocated by ORGANIC GARDENING, the completed compost is ready in ninety days. Compost is the nearest approach to Nature's own humus. There is nothing complicated or difficult about compost making. Compost provides the best means of establishing and maintaining soil fertility. The nutrients from compost are almost immediately available as plant food, and by improving soil structure compost releases certain land-locked elements of value to crops, as well as helping by its water-retentive qualities to check erosion and minimize dangers from drought.

Lily of the Valley

Poisonous Plants

By ROBERT O. BARLOW

LILY-OF-THE-VALLEY

READERS of this series have occasionally asked the question whether the plants, discussed as poisonous, would also poison the soil. True enough, few gardeners are apt to grow poisonous plants in great numbers, but they will want to have the beautiful foxgloves and the fragrant Lilies-of-the-Valley among their flowers. For this reason, I saved my answer until this time.

I know of no poisonous plant whatsoever that would affect the soil adversely. None of them excretes any poison that would harm the bacterial life of the ground around it, none will endanger a radish or lettuce that might grow near it, nor any other plant for that matter. Neither will the decaying leaves, flowers or stems be poisonous to the ground. How can we account for this strange phenomenon —a plant can poison a man, but it will not poison the bacteria or the crop plants?

As said in the introduction to this series, "poison" is a relative term; a seed that may poison man, is eaten freely by a songbird. As explained later, those plant poisons are, as a rule, combinations of a few simple elements that occur everywhere in nature; these compounds are so fugitive and easily destroyed that the druggists must take extraordinary precautions to preserve them in storage. Add moisture to Foxglove leaves and the poison disappears rapidly. This is exactly what happens in nature. With rare exceptions, such as poison ivy, discussed in Dr. Meyer's *Fence Row Observations* as being extremely resistant to fungi and bacteria, the residues of poisonous plants rot and decay as quickly as cabbage leaves or tomatoes; in other words, bacteria which cause rotting feast on them without being poisoned. There are some highly obstinate materials, as the composters know, plant residues of hops, leaves containing large quantities of volatile oils, such as oleander, eucalyptus, and even wintergreen and ivy, and leaves containing large quantities of certain acids. These invariably take a long time to break down. But with the exception of ivy and oleander leaves, none of these can be even remotely termed "poisonous" in the sense in which we use the expression.

Nut leaves, for example, serve as tea in herbalist practice, though I am not quite sure whether they do help in cases of bladder and gall trouble. It is possible that their bitterness made people think that they *ought* to help. But it is a fact that a layer of black walnut leaves acts like a mulch of pine needles. It does not allow many other plants to spring up, especially not the grasses, though much of the supposed damage done by nut trees is due to their big root system rather than their dead leaves. Other plants cannot compete with the actively growing walnut trees. Still, in a way, we might say that walnuts are aristocrats that prevent small fry from growing beneath them. The oak is, on the other hand, very tolerant of other plants, while the beech, again, is not; largely perhaps because its leaves form a dense mat on the ground.

The Bio-Dynamic Gardeners, whose work has been ably developed and explained by Dr. Ehrenfried Pfeiffer, contributor to *Organic Gardening*, have developed a system of growing garden crops together in mixed cultures, because one plant may stimulate the other. I cannot explain these matters, and I need not, since the information is offered by Dr. Pfeiffer's books. But I believe that in the final analysis the soil is the answer. When you plant cress and radish and cabbage together, you have three cruciferous plants, and they will all demand the same or similar minerals from the soil; they will deplete the soil of these substances and none will make a good growth. If you intersperse cabbage and lettuce or lettuce and radish, members of different plant families are placed side by side; they take up different substances and won't make each other serious competition.

And now, let's look at the Lily-of-the-Valley, which you can safely plant even if it is a "poisonous plant". Its fragrance is by no means poisonous. It is a member of the lily family, blooming white or pink, often unable to bear seed unless cross-fertilized by flowers from a different strain. This matter was discussed by A. B. Stout in the *Journal of the New York Botanical Garden*, September 1945. Since the oldest times, this attractive fragrant flower, called May Bell or May Flower in many European languages and therefore, in Latin, *Convallaria majalis*, has served for medicinal purposes. The glucosides contained in the plant, variously composed of Carbon, Hydrogen, and Oxygen, have been well investigated, and again as so often, modern science has found the old doctors sound. In 1939, Major and Leger wrote in the *American Heart Journal* that a root extract of the plant is preferable to digitalis, because it does not have adverse after-effects due to accumulation in the system. It does not cause heart block and also produces better diuretic effects, so often desired in cases of heart trouble, especially dropsy.

In the olden days, ground Lily-of-the-valley roots were part of a sneezing powder, used in cases of apoplectic afflictions and even epilepsy. In this country, the ground flowers were an official drug administered to epileptics, but are now no longer in use. When taken in larger doses, root extracts and ground-up leaves will cause vomiting and severe purging. But medicinally only small doses are given. Thus we have another poisonous plant that helps the physician.

One species, grown in antiquity, is called *Convallaria polygonatum* or Mayflower, a strongly growing plant with a strongly-odored root, of which old Dioscorides wrote that it was a good means against wounds and capable of driving spots from the skin. This would not be impossible, but it is improbable. Still, some research, dating back thirty years now, has shown that related plants of the Polygonatum genus, for example, the Solomon's Seals, have the same active principles as the Lily-of-the-Valley. In past centuries, the finely ground root of Solomon's Seal was actually used for dressing wounds and even as a face powder, just as iris root, that fragrant drug, is used in powdery mixtures today.

Organics Outyield Commercial Products

"A STUDY HAS BEEN MADE of the effect of several organic soil amendments on the yield of cotton grown on Mississippi soils". These soils were infected with the carriers of wilt disease (*Fusarium vasinfectum*) and root-knot nematodes (*Heterodera marioni*). "Four or more tons of stable manure per acre outyielded all of the commercial fertilizer plots up to and including the 1,200-pound application of 6-8-4." This is the experimental result of Pinckard and Leonard, published in the *Journal of the American Society of Agronomy*, No. 10, 1944. This result definitely shows that Sir Albert Howard's thesis is well supported by experimental facts. It also shows why manure is necessary for first-rate compost. A comparable amount of compost would, no doubt, have shown even better results because it would supply trace minerals and potash in considerable quantities, but in organic form. It sounds like magic, but it is a fact that an infected soil can be made healthy by the proper supply of organic material, part of which must be of animal origin.

SUBSCRIPTION PRIC

BIG SPECIAL OFFER

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OUR OFFER TO OUR OLD SUBSCRIBERS:

WE ARE SORRY to be forced to raise our rates to $2.50 a year beginning with May 31. Increased production costs and the double-sized magazine make this raise a necessity.

But old subscribers can obtain the magazine at the OLD PRICE by simply sending their renewal now. You save $1.50 on the standard three year renewal that more and more subscribers are taking. Three years of your finer and more comprehensive ORGANIC GARDENING will be yours for ONLY $4.75.

If you want to renew for two years, send us $3.50. The two years will simply be added to your present subscription.

Answers to Quiz

DR. PFEIFFER'S new book, No. 11 in *The Gardener's Book Club,* is entitled *Weeds and What They Tell.* Three of the grasses shown in the April issue are weeds, plain and simple. While some grasses, like Johnson grass and Bermuda may become weeds, they are frequently also cropped. But nobody likes Yellow Foxtail, though it is a relation of millet and therefore also called False Millet. Next to it is the common crab grass, one of the worst pests in midsummer. Lawns can be kept reasonably free from it if they are not mowed too low. For crab grass germinates only in the sun. On the following page you see Witch grass, so called because the brooms, the broken-off tops, ride through the air in late summer and fall to spread the seeds far and wide. But the fourth picture shows a good grass, the orchard grass, which is often sown for fodder; but it may occur wild and, when its sturdy bunches get going in a lawn, it may be considered a weed. Fortunately, it is easy to uproot, quite different from the pertinaceous quack grasses that spread by subterranean runner. Many such problems are discussed and many weeds are well illustrated in Dr. Pfeiffer's book.

VANCING MAY 31.

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NAME .....

ADDRESS .....

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ORGANIC GARDENING—Emmaus, Pa.

RESULTS

Have been reading *Pay Dirt* written by J. I. Rodale. I agree that chemicals are ruining our soil, where I used chemicals to make acid soil I find no earth worms. Now I am using coffee grounds and everything I can think of to get the earth worms back. I belong to the Garden Club in Kansas City, Missouri and our own Garden Club here in Fairway, Kansas. We are hearing a lot about compost. I would like to try it.

Mrs. F. G. E.,
Kansas City, 3, Kansas

—o—

I have followed the following treatment on my bed and found it gave excellent results in the control of weeds. In the fall I put on a thick mulch of half rotted compost. As soon as I stop cutting the aspargus in the summer, I put on a thick mulch of sawdust. If I can get some that has been used as litter in a chicken house, so much the better. If not, I try to get old sawdust but even fresh is better than nothing. The half rotted compost serves to feed the plants. The sawdust keeps the ground cool and wet through the summer and also keeps down the weeds. I never have to hoe at all. There are a few deep rooted perennial weeds that I pull by hand and I think I have them all out now so that I won't be troubled with them another year. I think you will find that this treatment will become more and more effective each year as a deeper mulch is built up over the plants.

E. T. L., Contoocook, N. H.

I have been using your methods of making compost and have had much better success with all my garden last year and am looking forward to a still better garden next year as my soil is getting so much more mellow and filled with earthworms than it was.

Mrs. A. F. W., Sappho, Wash.

—o—

Recently, when visiting in San Diego, I called on Capt. Spencer L. Higgins, U.S.N., Retired, and he showed me some very convincing results of the use of compost.

E. W. L., Covina, Cal.

—o—

The soil we have in this part of the country is what is commonly called adobe. We were told we would have great difficulty in working it, but thanks to "Organic Gardening" we have been able to grow everything we wanted to with no trouble at all. Nature's way is the only way to be successful, be it gardening, eating, or just living.

R. B., Hawthorne, Calif.

—o—

A couple of weeks ago we put a little of the finished compost around some okra that was about to die, and some young papayas that were just starting to bloom. The okra is alive again and producing better than it did at first, and the papayas have just about doubled in size.

M. C. L., West Palm Beach, Fla.

I started my compost heap August 10th. When I turned same after three weeks into the second section I marveled at the results. Part of it could easily have been used then.

E. F. von W., Seymour, Conn.

—o—

It will interest you to know that yesterday I used my first ton of completed compost. Judging from its quality and the simplicity with which this result is obtained, I see no reason why my plans for an organic farm will not succeed.

L. W., Watertown, Conn.

—o—

My subscription to "Organic Gardening" paid big dividends as my avocado trees were in "decline" and I brought them back by organic methods I followed by reading your magazine. Also want to state the cause of the decline of the avocado trees was the use of chemical fertilizer over a period of years.

Mrs. A. W., Vista, Calif.

—o—

You should see my "farm"—half the front lawn (11' x 14') and I have actually raised vegetables on it! In fact, we are having a pound and a half egg-plant, and cucumber, pepper, tomato salad tonight. It is crowded (even has a border of seeded dahlias) all done organically. I think it's rather an interesting project.

M. F. H., Tenafly, N. J.

Not long ago, we bought a small place on Fire Island. Fire Island, I may add, is little more than a sandbar, about a mile wide and seventy miles long, situated in the Atlantic off Long Island. At any rate, there is very little else except sand dunes, scrub pine, and various other wild trees and shrubs. No topsoil, of course, but here and there a sparse (1" thick) deposit of black humus that has collected under the carpets of pine needles.

Well, I put everybody to work except the cats. We all went around on our hands and knees grimly grubbing in the underbrush with anything from rakes to teaspoons, and finally we accumulated several cubic yards of this humus, all mixed in with dead roots, unrooted pine needles, in short everything.

Then this material was dumped where we hoped to have our garden, and spaded it into the sand along with several good barrow loads of seaweed, and several baskets of dead crabs and fish. Then we set out our tomatoes, onions, peppers, beans, cucumbers, beets, melons, squash, and so on. The results were too fantastic. You would have to see it to believe it.

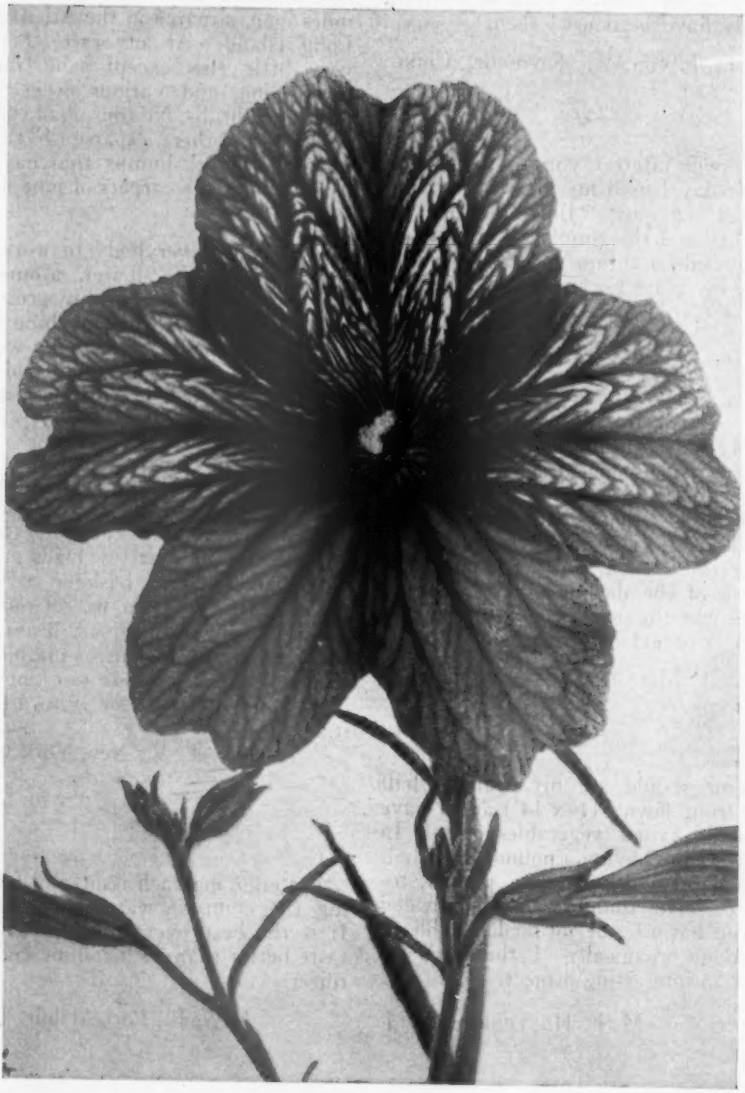
T. V., New York City

—o—

Am enjoying each issue and following the compost way of gardening. It is the best ever. Vegetables sure taste better than with commercial fertilizer.

F. W. R., Port Arthur, Texas

SALPIGLOSSIS means Tube-tongue. It is one of the most beautiful and easily grown annuals. If it had a more common name, everybody would have it in his garden, especially since it is a native of the Western Hemisphere like its sister, the Petunia.



Salpiglossis

W. Atlee Burpee

Over the Fence

by H. K. MEYER

The American Fuchsia Society published an excellently illustrated book of advice and experiences, *The Fuchsia Book*, available through Alfred Stettler, 125 Howth Street, San Francisco 12, Cal. Considering the beauty and usefulness of fuchsias, I advise every gardener to get a hold of this inexpensive booklet and add much beauty to his home.

•

Old Whittier is what would elsewhere be called "definitely Victorian," which means, I suppose, that he had solutions for his problems. One of those solutions is nicely expressed as follows:

Give fools their gold, and knaves their power;
Let fortune's bubbles rise and fall;
Who sows a field, or trains a flower,
Or plants a tree is more than all.

•

Milk that is toxic is produced by animals getting DDT in their feed, says H. S. Telford in *Country Gentleman*, January, 1946. On the second day after an application of DDT the milk began to kill rats. If you recall that rats are used in tests for many human weaknesses because they react so similarly to us, you might wonder if you shouldn't go back to the land and raise your own cows.

•

Back to the land is the idea of a book by Professor John C. Gifford of the University of Miami, Florida. The book, entitled *LIVING BY THE LAND*, sold by the author at $2.50, is beautifully illustrated and full of meaty thoughts. Readers in the warmer regions will enjoy it doubly, but everyone with an interest in country life and in plants should benefit by the suggestions and musings of the lovable author. I recommend this book whole-heartedly.

•

One of our subscribers, J. C. Adderley of Pensacola, Florida, operates a model farm of 1200 acres *without any chemicals whatsoever*. His farm is well known and widely publicized as "Tung-Empire Farms", and one of the writers about this great enterprise ends his article by saying: "Young Man, Go South!"

•

Organic Soil cover is the only safeguard of the warmer regions. *Science News Letter* recently told of the dangerous situation in Australia. This used to be a rich meat export country. Now the land has been over-stocked, the soil cover is disappearing, and the artesian wells have given out. While the number of wells has quadrupled since 1900, the water flow has fallen to one half of its former volume. Similar worries have already beset South Africa, as *The Farmer's Weekly* of Bloemfontein reiterates in every new issue. This excellent farm magazine really shows what happens when land is unwisely handled. By the way, government interference in South Africa seems to be rather pronounced. But since that magazine carries forty large pages of advertising, South Africa must still have something to sell. Yet, they *are* worried.

Our pet peeve, DDT, is dangerous. A preliminary report issuing from the Agricultural Experiment Station at Berkeley, Cal., shows that alfalfa and Bartlett Pears carried considerable residues of the dangerous poison. It would be too bad if spraying became more and more enforced. The pears might look better, but the eaters will get worse.

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Applying chemical weed-killers other than hormones may seriously affect some crops, as a study by A. S. Crafts, Professor in the University of California, shows. The paper is printed in *Hilgardia* for May, 1945. One of the chemicals used was retained in fine colloidal soils.

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Dr. Zimmerman of the Boyce Thompson Institute writes us that tomatoes with and without seeds showed no appreciable difference as to sugar and vitamin C. Nor was there any difference in weight. But there is no definite information avaliable on the other interesting factors. Plants store important minerals and compounds, such as proteins, in their seeds. What happens when the plant has no seeds, because the flowers were treated with a hormone that prevents seed formation—a scientific problem of the first order to which the leading scientist in line has not yet an answer. There are many more unsolved problems in plant physiology than answers.

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I hear from my former associates in the university where I used to teach that the registration in chemistry and engineering is extremely heavy. I had thought that there would be more engineers and chemists than we need for a while; but these disciplines hold an amazing attraction to young men. They never did to me. I always wrecked the toy trains I got for Christmas. When my class mates were given electrical gadgets I thought this mere child's play. My ambition was to grow tuberous begonias from seeds. And I still think that living with nature is most rewarding. We would be better off if more youngsters learned about flowers and fewer read about atomic energy and looked at silly superman cartoons.

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"We Australian organic enthusiasts" have formed an association called the Organic Farming and Gardening Society, writes H. F. White in the Australian newspaper, *Farmer and Settler,* Sydney and Melbourne, on January 18, 1946. We of *Organic Gardening* wish them great success.

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Sir Albert Howard is the editor of the new English compost magazine, *Soil and Health,* a quarterly costing 5 shillings, postfree anywhere in the world. Subscriptions are received by Miss E. Kirkham, The Rise Milnthorpe, Westmoreland, England. The first number contains, among other interesting items, a review of J. I. Rodale's *Pay Dirt,* which is compared in importance to such works as King's *Farmers of Forty Centuries* and Carrel's *Man the Unknown.*

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The wide-awake *Men's Garden Club of Watertown, Conn.,* according to *The Hoe,* splendidly edited by David F. Lane, sent a petition to the responsible Senators and Assemblymen asking that they prepare and introduce legislation for state control of DDT. This is something of the utmost importance. We do not know whether the manufacturers of DDT maintain lobbies, but we do know that the chemical industries have in years past exerted considerable influence. It is amazing, after all, to see them capitalize on this poison when the responsible investigators in the Department of Agriculture and elsewhere clearly stated that DDT was of rather dubious merits, when they and other agencies warned against its random application, and when definite research work shows that it is a poison that accumulates. It is now being used in many milk barns to control flies. But a few bacteria carried by

flies are much less dangerous than a poison of such power. The model of the *Men's Garden Club* of Watertown should be imitated and the chemical industries should be controlled for the public good. The commercial success of these enterprises means nothing where public health is concerned.

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A similar movement against lethal sprays is under way in Cleveland, Ohio. The bees are supported against the poisons by the Garden Centre of Greater Cleveland, as we learn from their Bulletin and the Watertown *Hoe.*

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R. W. Westwood, Editor of *Nature Magazine,* published by the *American Nature Association,* is doing a wonderful job, upholding man's responsibility for plants and animals, informing us about what is going on in wildlife conservation and every other phase of outdoor life. Nature lovers will particularly enjoy the fact that the state of Vermont has done away with billboard advertisements. When you consider that nobody will be any worse off if the competition does not advertise on the highways, since all brands still have an even chance, you may wonder why not more states follow this sound model.

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One of our subscribers in Michigan sends us an excerpt from an old Dutch book, printed in Amsterdam 1670, which shows that the natives of the East Indies used straw and grass mulches at that time.

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More and more daily papers have come to stress the importance of organic matter in the soil, a sure sign that organic gardening and farming has come into its own. Off and on we do get letters from people who wonder if the plants cannot be fed by carefully ground rocks. The fact is that plants in nature drop leaves and other matter; that minute plants, such as bacteria, populate the soil and break down rocks; and that, in general, the soil is not a chemical compound made up of minerals; but, if fertile, a soil is rich in humus. R. E. Harman put it correctly in a recent number of the Newark, N. J., *Sunday Call* when he said: "Soil bacteria thrive and do their work more efficiently if organic matter is present in the soil for them to work on. They convert insoluble nutrients into the soluble state so that plant roots can assimilate them as plant food." This explains why regions without rainfall, the so-called deserts, may be rich in nutrients, but do not grow plants until water is supplied and an organic cover started.

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Adaptation of plants to environment is something few people have studied. New data are coming to our knowledge all the time, but no handbook exists which would collect the available information. Thus, when a subscriber writes and asks: "Can I grow corn on my land, which is a heavy loam soil?", we can only answer: "See if it grows!" Nobody can predict about plant growth under unknown conditions of soil and weather. When our highly bred American hybrid corn was tried in Mexico, where corn has been grown for ages, it proved as poorly adapted as the high-bred European Calville apple in the U.S.A. But one of the 800 Mexican varieties tested grew right there. This fact was brought out by E. J. Wellhausen at the Columbus meeting of the *American Society of Agronomy.*

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With Boron deficiencies becoming quite a problem in certain regions and with certain crops, we find again that the organic method has the head start. *Berger and Truog* of the University of Wisconsin said at the same meeting, after testing thirty-four virgin and forty-eight cultivated soils, that the organic matter in the soil made boron available to plants. Soils with a high lime content and soil depleted in organic matter were found to be low in boron that the plants could use. It is not enough to have boron in the soil, it must be available, and avail-

ability seems to be in most instances connected with nothing so much as humus—another fact which shows the absolute soundness of the organic method!

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Why does permanent sod increase the nitrogen content of the soil? One reason is, according to Bulletin 464 of the *Pennsylvania Station* that a bacteria, called clostridia, which lives in the absence of air and thrives in acid soils, likes to live under sod, as J. W. White was able to prove. This bacteria does not enter into a relationship with plant roots as the nitrogen-fixers on clovers, alfalfa, locusts, and other legumes do. The method of clean culture formerly recommended for orchards is therefore gradually abandoned for permanent sodding and mulch culture.

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That old Negro that was written up in *Life,* sometime ago, reached a rather nice age, one hundred and twenty years. When asked how he did it, he said that he ate what he liked, chickens, eggs, biscuits, etc. He smoked too. This doesn't mean that I advocate his fare for every one else, but I am sure that you will live longer if you manage to do as you please rather than to force yourself to do unpleasant things. *Science Digest* mentioned the protein value of earthworms. Earthworms may be fine for the soil, but I shall certainly not have them for dinner.

Gardening Device

BEFORE LONG you will think about staking your tomatoes. True, the tomatoes yield more heavily if they are allowed to spread on the ground. They sink down additional "adventitious" roots and draw more nutriment from the good earth. But the home gardener's space is limited, so he prefers to prick out side shoots and trains the plants upward. The main advantage is that more sun strikes the fruit and few slugs can get at them. Tying a tomato vine to a pole of five or six feet length is a sound practice, building a trellice is not unusual, but there also is the method shown on the picture, which applies also to other plants that need staking. A strong wire is fastened to a firm piece of wood in such a way that it does not sag easily: Two holes are drilled on top of one another as the picture shows.

A Robin cares for its young. Courtesy Audubon Society Photo by Laurel Reynolds

Bird Nests

By RICHARD HEADSTROM

ONE morning in early May many years ago I was awakened by a curious tapping sound. It was a Sunday morning and it was somewhat past my usual hour of rising. At first I thought there was someone at the front door—perhaps someone who, finding that the bell had failed to ring for some reason, had taken to knocking on the door in an attempt to awaken me. But as I lay and listened the sound seemed to come rather from the rear of the house. The tapping would come and go and sounded very much as if someone were knocking on something. There was no one in the house but my wife and I and my wife had not yet awakened. I was puzzled how to account for the sound and realizing that I would not discover the cause of it by remaining in bed I got up to investigate. I was somewhat perturbed, too, for fear that it might be due to something that had broken during the night and which needed my attention.

I traced the sound to the kitchen but when I got there it had stopped. I glanced around and so far as I could see there was nothing wrong. But then suddenly I heard it again. It came from one of the windows. I turned quickly and saw a robin sitting on the outside window sill looking into the room. I remained motionless and watched her and after a few mo-

ments she tapped again on the window pane with her bill.

I don't know how long she would have stayed there had I not eventually frightened her away by moving. I never saw her on the window sill after that nor did I ever hear the tapping again. She remained, however, about the house for she and her mate had taken possession of a cedar tree which stood on my grounds and were at the time engaged in building a nest in it. Apparently on one of her many trips of fetching material with which to build her home she had spied something through the window which had taken her fancy. It is also possible that she had seen her image in the glass and had attacked it, a thing that robins are known to do.

I had watched with considerable interest, during such moments as I could spare, the construction of the nest. It is one of the profound mysteries of nature how birds without having been shown how or without any previous experience will not only proceed to build a nest but build a nest of the same design as that followed by countless ancestors and also use the same materials, as far as possible, as those used by their forebears. We call it instinctive behavior and yet I sometimes wonder if some intelligence does not enter into it. Birds select sites for their nests with the greatest care and build them, as a rule, in inaccessible places or where they will be most completely hidden from their enemies and where they will also get the maximum protection from the elements. The selection of a site is said to be an instinctive one and yet where a bird may have the choice of several sites it would seem that something more than mere instinct determines their final choice. My robin doubtless had examined several sites before finally selecting the cedar tree and I am somewhat inclined to question the view that her selection was wholly instinctive; rather I would like to believe that she had good and sufficient reasons for her choice. I recall one year having seen a robin try to entice his mate to use a nest which he had used the previous year but she preferred to build a nest of her own. Her decision in this case might have been due wholly to instinct but on the other hand she could just as well have used the ready-made nest and saved herself considerable trouble. I am still curious to know if a choice between two alternatives could be made wholly by instinct or if she weighed the pros and cons of the matter and then finally came to her decision for reasons known only to her.

It is a curious thing that some birds will build a nest without a greal deal of attention as to concealment while others will go to great lengths to hide them. For instance, the meadowlark and some sparrows arch their nests over with growing vegetation; the oven-bird covers its nest with dry leaves from the forest floor where it rests; while the ruby-throated hummingbird and the wood pewee, which are unusually adept in the art of camouflage, cover their nests with lichens so that they appear to be mere excrescences on the branch of a tree.

It is a curious thing, too, that some birds make only a slight pretense at building a nest, while other build a crude one, and still others an elaborate structure. The killdeer is satisfied to deposit its eggs in a crudely-lined hollow in the ground. So too are the spotted sandpiper and the upland plover. The whip-poor-will doesn't even fashion a hollow but merely lays its eggs among dead leaves, as if aware that its eggs resemble so closely the color and pattern of the forest floor that only with difficulty can they be discovered. Long ago, the woodpeckers discovered that by laying their eggs in hollow trees, the eggs would have better protection against the elements and various enemies than if they were laid directly on the ground. This was a step in the right direction but the woodpeckers have not advanced beyond this point. There was, of course, no need for them to do so. Birds build nests to serve primarily as

a cradle for their young and to hold their young together until they are able to care for themselves and a hollow cavity fulfilled this purpose admirably. So to-day, the woodpeckers continue, as they have done for generations, to bring up their families in hollow trees or in cavities that they might excavate themselves.

Some birds have gone a step beyond laying their eggs on the ground or in a slight depression and build crude nests. One such bird is the mourning dove which builds a loose platform of twigs. The yellow-billed cuckoo does slightly better but its nest is still little more than a shallow frail platform, so loosely constructed that the eggs appear to be in danger of falling out through the interstices. Crows, hawks and catbirds have progressed somewhat further in the art of nest-building, for while they still use sticks they build deeply hollowed nests and line them with softer materials. The robin, on the other hand, builds a bulky, compact, thick-walled structure of mud, reinforced with grass and straw. In contrast to these nests is the dainty, trim affair of the ruby-throated hummingbird and the exquisitely woven structure of the Baltimore oriole, perhaps the finest examples of native bird architecture.

Appearances are often deceiving and no more so than in the case of the ruby-throated hummingbird. Here we have a minute, sprite-like bird, hardly larger than an insect, and yet a bird that thinks nothing of travelling thousands of miles each year back and forth from its home in the tropics to its breeding grounds in the north, crossing the dangerous waters of the Gulf of Mexico with little concern. Low temperatures, too, have no terrors for it for this unusual bird has been found about and active when the temperature has been as low as 22° F. It is quite in keeping with the character of this little bird that its nest should be the dainty affair that it is. Cup-shaped and very small, measuring on the average 1½ inches outside diameter and 1¼ inches outside depth,

Nest of Hummingbird
Photo by Arthur A. Allen
Courtesy Audubon Society

it is made of plant down and usually placed on a small, down sloping branch, to which it is fastened with spider's or caterpillar's webs. It is, moreover, covered so perfectly with lichens as to appear a mere protuberance on the limb.

The nest is so wonderfully camouflaged that one finds it only by accident, or, as I did one year, by the behavior of the female. It was some fifteen feet from the ground and apparently not quite finished for though it had taken shape she was at the moment busily at work on it. The lichens were apparently all in place for she appeared to be weaving something into the walls and the lichens are put on the outside before the plant down is put in. I watched her work and every now and then she would fly away, to return some minutes later with a piece of down. This she would tuck into the walls on the inner side with her bill, which she used as a needle, and then when she had it firmly in place would proceed to adjust the lichens on the outside. The female, as is the case with most species, did all the work and I did not see the male while I was in the vicinity.

All sorts of materials are used in nest-building. Many birds, like the field and grasshopper sparrows, use grass. The hawks and herons build their nests of twigs and sticks. The red-eyed vireo uses strips of bark, bits of dead wood, paper and down of plants. The robin and phoebe use

mud, and the parula warbler weaves a nest of usnea lichen already hanging from the tree limb. The goldfinch lines its nest characteristically with thistledown, the barn swallow with poultry feathers. Sometimes, however, curious substitutes are used as the hairpins and wire clippings which a wren used and the strips of paper which a robin used from a nearby paper factory in place of the customary grasses. Crested flycatchers normally use cast snakeskins but now they frequently pick up cellophane cigar wrappers instead.

Despite the fact that nest-building is instinctive, birds are not necessarily bound by hard and fast rules. Sometimes they will depart from their normal procedure and not only use different materials but will also adapt themselves to varying or changing environmental conditions. The red-wing, for instance, will build a much deeper nest in a place subjected to strong winds than in a sheltered location. The chimney swift now builds in our chimneys in preference to the hollow trees in which it formerly nested, and we find the phoebe and the barn swallow making use of man-made structures, whereas they originally built their nests on rocks.

In pursuing this subject of nest-building we discover that nests are placed in almost every conceivable location. The song sparrow may build its nest beneath a tuft of grass, the great blue heron in the tallest tree, the chimney swift in a chimney, the yellow warbler in a low bush, the black-capped chickadee in a decaying stump, the house sparrow in an electric light hood or waterspout, the osprey on the crossbar of a telegraph pole, the crested flycatcher in a hole in a tree, and the house wren in the most unlikely places—even in an old tin can or the fold of a blanket hanging on a clothesline. Some, too, like the kingfisher and the bank swallow imitate our burrowing mammals and excavate a burrow in which to build their nest.

The kingfisher usually chooses a sandy, clayey or gravelly bank in which to dig. He prefers a bank near his favorite fishing grounds but he is not always lucky to find a suitable one near water and in that event he might be forced to excavate his burrow some distance away, as in the embankment of a railroad cliff, the cliff of a sand dune, or in a bank by some roadside where sand or gravel has been taken out for grading.

As a rule the kingfisher begins his burrow about two or three feet from the top of the bank and in the digging he is assisted by his mate. They take turns, first one digging and then the other. The length of time it takes for them to finish their burrow depends on the kind of soil that they have to remove. Sometimes it may take them as long as two or three weeks but usually they do it in less time. A pair of these birds have been known to excavate a burrow five feet deep in a clay bank in a little over three days, a really incredible achievement considering their short and weak feet with which they must remove most of the material.

When completed the burrow has a slight upward rise and is usually straight or nearly so, but sometimes it curves slightly or makes a more or less abrupt turn to the right or left. It measures from three to six feet long but may even be as much as ten or fifteen feet long. The entrance, and the burrow itself, are not quite circular, as a rule being three and a half to four inches wide and three to three and a half inches high. At the end of the burrow, or near the end and a little to one side, the birds fashion a chamber. This chamber, which they usually exacavate slightly above the level of the tunnel, may vary in size and shape but is approximately circular and dome-shaped and ten to twelve inches in diameter and six to seven inches in height. Here the kingfisher will sometimes construct a quite elaborate nest of fish scales and bones which he arranges in a compact, saucer-shaped mass, but as often as not

he will let his mate deposit her eggs on the bare sand or gravel.

Like the kingfisher, the bank swallow builds his nest at the end of a burrow which he excavates usually near the top of a nearly vertical bank of a lake or stream or one provided by the excavations of a railway or gravel and sand pits. The depth of the burrow varies with the kind of material in which it is dug. Burrows have been found which varied all the way from nineteen to sixty-five inches. As a rule, the burrow is dug directly into the bank with a slight upward rise. I do not know the reason why these birds dig their burrows with a slight slope; possibly they do so to prevent water from running into the nest during a heavy downpour of rain. The entrance to the burrow measures about one by two inches and the chamber in which he builds his nest is something like three by four and a half by six inches.

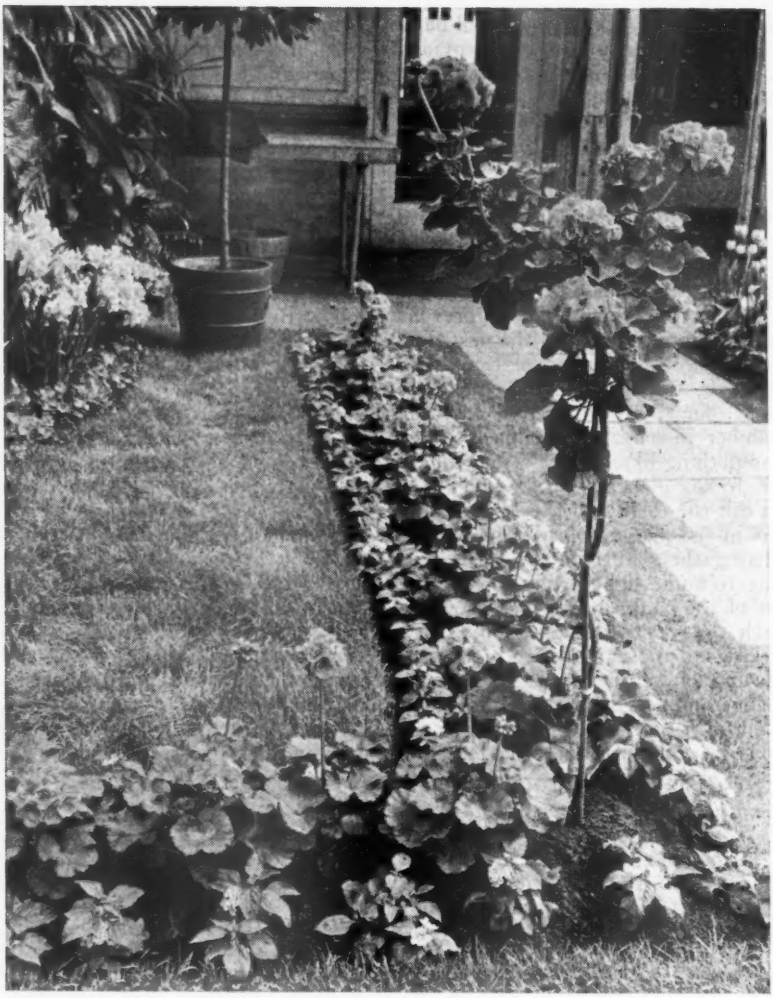
Both the male and the female take part in the digging operations. When starting their burrow, the birds first cling to some light projection on the side of the bank, from which they can reach the point of attack, and start pecking at the earth with a side-to-side motion of the head. As soon as the opening gets deep enough for them to get partly inside, they begin to use their feet also, kicking the loosened earth backward in vigorous little spurts. Later when the burrow gets still deeper, they also make use of their wings, "shuffling" them rapidly in a backward and forward motion.

Bank swallows seem to regard the task of excavating a burrow rather lightly and look upon it as play rather than work. A swallow will labor strenuously for a few moments and then stop and fly through the air. Like the prairie dogs, swallows are sociable creatures and many of them will dig their burrows in the same bank. They also delight in taking to the wing and mix pleasure with work, something which we do not seem to do successfully. But a swallow does not forget his responsibilities and after flying about for a few minutes will be back on the job.

As soon as the burrow is completed, both the male and female at once proceed to carry in the nesting materials. The materials which they use depends more or less upon what is available in the vicinity. They might use grass stalks if a freshly mown hayfield is near at hand or straw if a farmyard is not too far away. They might also use weed stalks and rootlets, as well as horsehair and sheep's wool, and a few feathers for the lining, but usually they will not use a large amount of feathers until the female has laid her eggs and has begun to incubate them.

Organics in North Dakota Clay Soils

THE FERTILITY OF OUR SOILS is the title of a study by T. E. Stoa in the *Bimonthly Bulletin,* of March 1942, North Dakota Experiment Station. We read there that "manure plus steamed bone meal gave an average increase of 13 per cent for corn and 21 per cent for wheat the second year. Manure plus ground raw rock phosphate gave an average increase of fifteen per cent for corn and fifteen per cent in the yield of wheat. . . These results with the less soluble phosphate are interesting and somewhat different from what one might expect." Interesting, indeed, for the rock phosphate showed up better than manure plus superphosphate.



Geranium McFarland

Some Geraniums I Have Grown

By EVELYN SPEIDEN

"DO you have the Lady Washington Geranium?" was the question asked so many times by friends as they looked at our assortment of several dozen kinds, that I began to wonder secretly what this mysterious variety could be which everyone seemed to know yet not to recognize. After several years I discovered one day that three plants just bought as pansy geraniums were also called Lady Washington. Here was the elusive lady at last, but from her appearance I wondered why she was so famous. What there was of foliage was not fragrant. The plants were mostly woody stems and for some time looked only half alive. As they began to grow I watched developments with much curiosity. Months later the buds opened into brilliant blossoms, one sort a delicate pink cluster, another magenta with a black-marked center, the third scarlet. Still no fragrance, yet the conspicuous and lasting blossoms were certainly the most notable in the geranium family, I decided, and could well be called "Show Geraniums". Each flower was an inch or more across and a bush full of them quite as lovely as a pot of azaleas. More woody and compact in growth than the ordinary geranium, they need less pruning as they develop into shrubby plants. As greenhouse or house plants they do well, although perhaps requiring somewhat more skill in the grower. Outdoors they need a cooler spot than most geraniums and not too much of summer sun and heat. Although they were certainly very beautiful during their limited season of bloom, I concluded they could not take the place of the scented-leaved varieties whose fragrance provides joy the year around.

Of these there are many and quite varied sorts, in fact so varied in foliage texture, size, shape, color and fragrance, as well as in habits of growth, that a stranger would scarcely think them of the same family. Even their names are charming and reminiscent of the days when they stood in the windows of our great, great grandmothers. Among the ladies are Fair Ellen, Lady Mary, Clorinda, Lady Plymouth, and Mrs. Taylor; the gentlemen include Prince of Orange and Prince Rupert; suggestive of their appearance are the Crowfoot, the Giant Storksbill, the Grossuloides, the Ivy-leaved, the Oak Leaf, the Skeleton-Leaved and the Pheasant's Foot; telling us of their scent are the Apple, the Balm-Scented, Cinnamon, Lemon, Nutmeg, Filbert-Scented, Orange-Scented, Spice-Scented, Peppermint and the best known of all,—the Rose.

Most of this group would not acquire fame on account of their blossoms, which are generally smaller and less conspicuous than those of our ordinary geranium. Yet they are often lovely in a different way. A plant of the Nutmeg or Apple Geranium full of its delicate and dainty flowers, gives the impression of being surrounded by tiny, white butterflies. Fair Ellen and Oakleaf are closely related. The former makes a shapely little bush, while the latter is a much-branching, rather sprawling plant, good to hang over the edge of a window box. Both have irregular, somewhat oak-shaped leaves with dark markings and flowers of rose pink, but Fair Ellen's blossoms are larger with attractive dark spots. Their foliage is pungent though less distinctive in its scent than many others. The Ivy-leaved is another valuable one for hanging baskets, since it

Pelargonium

T. Horace McFarland

Upper row: Balm-scented, Skeleton-leaved, Peppermint

Lower row: Lady Plymouth, Rose Geranium, Rose-scented

is more or less vine-like. Its flowers are large too, and in color may be white, lavender or pink, but it is without much odor.

Citronella, or Finger-Bowl, grows stiffly upright, yet bushy and much branched, and of all the group has the tiniest leaves, smaller than a fingernail, crinkle-edged and strongly lemon-scented. It does not need its small pink flowers to make it a very distinctive little plant. The Lemon Geranium is a close relative but larger in growth and leafage and with flowers of lilac. The Orange-Scented, midway between these two in size, is also similar.

Dainty cerise to carmine flowers are found on the Filbert-Scented, the Cocoanut-Scented and Mrs. Taylor; variegated leaves on Prince Rupert, Grossuloides, Lady Plymouth and Giant Storksbill. I can tell you here but a few of their outstanding characteristics. To get really acquainted with them, you must grow them yourself, and you will find how each has a distinct and individual interest of its own. One of the most surprising is the Peppermint. Its large, velvety green and strong-scented leaves are its main attraction and these form a beautiful mass of foliage when given plenty of space in the garden to spread.

If one has a sunny, south window, all these make good winter companions, either potted separately or still better in a window box with small-leaved ivy, herbs such as marjoram, thyme, bush basil, chervil, chives, burnet, rosemary, parsley, savory or other not too dominating house plants. It has always seemed to me that plants indoors do better in a window box where mixed roots can find their varying needs in the soil and where a larger mass of earth can hold moisture longer and so require less frequent wetting. Foliage as well as soil needs occasional wetting too, to remove dust and take the place of rain.

In the summer set them out in the garden in full sun and with more space than you expect them to need for growth. Many will spread surprisingly, in fact, by fall you will wonder how to manage such large plants in the house, for all are tender and must be brought in again before frost. All this group do better if at transplanting time they are pruned back severely, yet the amount of pruning may depend somewhat on the space you have available. Eventually the old plants will certainly become too large, and preparation for this time must be made by having young ones grown from cuttings. Take these preferably in midsummer from sturdy, growing tips cut to not over an inch or an inch and a half of stem. Remove all leaves except the one or two on the end. Do all this cutting cleanly and with a sharp knife. Set the cuttings in a box of sand and keep them moist and shaded until they have rooted. Then they will need to be moved to good soil where the roots can find more nourishment than the sand provides. If potted they should be set first in the smallest pots and only removed to larger ones as their roots need expansion space. Plants in pots too large for them are no better off than if crowded into too small ones, for the soil is apt to become sour if the roots are not able to take up the moisture sufficiently. Geraniums of any kind will not endure a sour condition. "Minimum water, maximum sun" is a good rule for all geraniums.

The common geraniums of red, pink or white, probably the best known of all house plants, are propagated and cared for in the same way as these sweet-leaved varieties, so if you have had good luck with them, you need not feel timid about making the acquaintance of their more aristocratic relatives.

If, however, you have a desire to learn more from the botany books than I have been able to tell you here, you may not find any of these plants listed under "Geranium". The true geraniums, Geraniaceae or Cranesbill, are mostly natives of the north tem-

perate zones. Of their over 250 species, the best known are the Geranium maculatum, the wild geranium of our woods with its lavender, five-petalled blossoms, and the Geranium Robertianum or crimson-flowered Herb Robert. Both are hardy and make good border or rock garden plants. Our house plant "Geraniums", on the other hand, are practically all from South Africa, which accounts for their being tender. Botanically they are called Pelargoniums, or Stork's Bill, because the long slender fruit is supposed to resemble the bill of the stork. The history of their cultivation goes back more than two centuries and includes so much hybridizing and cross-breeding that it is often difficult to trace. There are said to be from 163 to 232 species, besides many hybrids, so collectors can find problems here to their hearts' content.

All this is not necessary to our enjoyment and use of the few plants which most of us can have. We may be familiar with the old custom of dropping a leaf of the Rose Geranium into apple jelly, or of mixing its leaves in Pot Pourri after they have been dried; and other geraniums may be similarly used. However, they are most to be desired just for their companionship during the winter months when we can learn to appreciate increasingly the beauty and variety of their leaf forms, textures and colors and enjoy the delightful fragrance which will reward us each time we sprinkle their foliage.

Sweet-scented Geranium McFarland

Irrigation and Watering

By EHRENFRIED E. PFEIFFER

THE seed bed was just ready with a fine and crumbly structure. Then came the rain. After it had dried up you went out to the garden and thought: now we have the best conditions for sowing. But what did you find? The rain had thrashed down the surface, hardened it and in places you could even lift a thin crust from the under-lying soil. You had to do your work all over again and loosen the soil by hoeing and harrowing. Another time the rain lasted several days and puddles of water stood on the fields. It was a rainy season anyhow and after a while you observed that the soil became increasingly tight and hard; when it had dried up there was a hard pan left underneath. The water began to run off from the fields, first dark brown in color, then in shades of lighter brown to yellow. You were losing soil, for the earth could not absorb any more water.—

Once you have reached this point in your observations and have become conscious of the changes in soil structure in connection with rain and standing moisture, we advise you to report to your kitchen in order to get a few tall one-lb. jars and a scale for a little experiment. Fill the glasses one-third full with equal amounts of the following: One with pure sand, one with your soil, one with heavy clay, one with fresh manure, one with the very best compost you have. The materials you use should be "air dry", that is, they must be kept in a dry, warm place for several days, so that any excess surface moisture could evaporate. Weigh the jars with their contents and make a record. Then add water, pouring it carefully into each sample in each jar, just as much as the soil will take, with a trace standing on top. Weigh them again after the samples have absorbed the water and find out how much water each kind of soil can take. After this, you prepare a second experiment: Take pure sand, clay and soil, mix 2/3 of their weight with mature compost; another set with well-rotted manure. Repeat the above procedure of pouring water until final absorption. You may have to add water a second time in some cases. Weigh finally and see what now happens.

When you compare the results, I am sure, you "have got the thinking", to use the expression of one of our farm hands. As you grasp the meaning of these results and see the water-holding power of soil rich in organic matter, you have learned something about irrigation.

A good humus earth can hold water up to 2½ times its own weight, while pure sand may only hold water equalling half its weight. Some 35 years ago, Russian scientists observed that the natural formation of the most fertile black soils took place only when rainfall and evaporation of water were balanced. Humus holds moisture. Professor Jenny, at that time at the Missouri Experimental Station, reported 15 years ago, that in a drought period virgin black soil could hold moisture for six weeks. An intensively cultivated soil, on the contrary, although of the same origin, but which had lost 30-40% of its original humus, would hold moisture only for two weeks. The virgin soil remained crumbly to great depths; the other soil hardened and crusted.

Keeping all these facts in mind you will avoid ruining your soils by

irrigation and excessive sprinkling. Here the organic gardener has quite an advantage, for he has already added the necessary compost and manure to the soil which help to absorb and hold moisture. He needs less irrigation and sprinkling with water. Should he have also applied mulches, he would have added another procedure to preserve moisture. For this is the truth: The less water one has to add by means of "artificial" systems, the better it is for the structure of the soil. Sprinkling, even out of a spray can, if repeated, always forms a surface crust. Standing water from irrigation forms a hard pan underneath. Sprinkling is bad for the seed bed, when the first leaves want to break the crust. It is bad also for aeration, bacteria and algae life. A hard pan is bad for the development of fine hair roots and for the nitrogen life in the soil, as well as for underground drainage and earthworms.

Sprinkling, in the form of a very fine mist, does the least harm, but it is expensive on account of losses through evaporation; in many cases it is not feasible on account of low water pressure.

There are on the whole two systems of irrigation: The basin system, where the edges of the field are raised up, so that the entire basin can be filled with water. The other system is the furrow system, where the water runs along the furrows. A distributing ditch is on one side; the excess is collected on the other side of the field and led to the next field.

From the organic point of view we cannot say anything in favor of the basin system. The soil will be hardened. However, should there be enough humus in the soil and just enough water given to remain for a very short time on the surface so that the near end of the field is already drying while water is still running to the father end, no harm will be done. We know that people in some irrigation areas say: "We have to buy the water and take it when it comes, therefore we want to keep as much as we can". But with the basin system you buy more than you need and more than your soil can hold.

The furrow system is better. It offers a greater surface for watering, on the average one-third more; the soil is better loosened up, therefore more water is absorbed; there is also more soil life, therefore more water is retained. It is the famous and oldest irrigation system of the world—the Egyptian—and has been developed over there with great wisdom. Usually there is one main feeding artery from which many furrows branch off. Only that much water is allowed into the furrows as can be absorbed. There should be no over- or off-flow at the other end. Watch the running off at the farther end of your system! When the run-off water is colored black or brown you are losing humus. When it is colored the shade of your soil, brown, reddish brown or red, you are losing your soil. When it is colored light brown or yellow, you are also losing your subsoil. When it tastes sweet and is clear, you are losing nothing but the water. When it tastes bitter, you are losing your minerals. The same rule may be applied to your drainage system, tile or ditch.

The ideal irrigation for the small gardener as well as for greenhouses is underground irrigation. Underneath each bed, at a depth just below working level, at about 2 ft., there is laid a 4 in. porous drain tile line with very little pitch. At one end is the connecting head channel, a concrete ditch, maybe 1½ to 2 ft. wide, 2 ft. deep, from which the drain tiles start. The other end of the tile line is plugged up. The connecting head is filled with water until all pipes are running full. Then stop adding water. The water gradually soaks through the porous tiles and ascends through the capillarity of the soil towards he surface.

The amount of water is right when the surface just begins to show moisture. With this method, there is very little moisture loss through evaporation. There is very little soaking into

the subsoil, because the tile line is laid just on top of the harder subsoil and the capillarity of the life soil counteracts gravitation. This system encourages a deep root system and, since the soil is never "wet", also microbial life and the earthworms. The tiles will last from seven to ten years, and the initial investment can be extended over a long period. This underground irrigation is time-saving too as compared with sprinkling. You will have to water much less frequently. Put a swimmer valve in the head channel and the water will not run over once you have turned on the faucet—then forget about it.

For a 100 x 100 ft. garden patch with 4 ft. wide beds, plus 1 ft. path, that is, 20 rows of 100 ft. length are needed, or a total of 2000 ft. tile at 7 cents per foot or $140. This may sound high to begin with but distributed over 7 years the expense is $20.00 per year. You may save about 60 hours of sprinkling, worth $24.00 per year, besides getting the biological advantage for your soil. Also there is less crop failure, and the permanent moisture allows intensified crop rotation. One can expect to obtain from 50% to 100% more crops at the driest time of year. Perhaps it would be a wise move to start the underground irrigation under half of the 100 x 100 ft. lot for all leafy vegetables and move the late fall vegetables and the tomatoes, the potatoes and the sweet potatoes, the late corn to the other section of the garden, thus reducing the initial cost to half and still having the full advantage.

Should you, however, still have to use the old sprinkling way, take care that the surface soil is frequently loosened up. Or, if you use irrigation, be sure that the soil is well and deeply cultivated. But we must never forget that the presence of humus is the best "watering" system.

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Reader's Correspondence

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BLACKBERRY RUST

Q. If you know of any organic method of combatting orange rust on blackberries kindly print the remedy in your next issue of Organic Gardening".

R. L. T., Richmond, Va.

A. When blackberries suffer from rust which is a fungus disease, the indication is that the natural conditions for healthy growing are lacking. The best way of bringing about the latter is two-fold. You want to give the berries a heavy mulch consisting of a mixture of straw and leaf mold, such as you can prepare yourself in a leaf pit, and you want to give them, after the bearing season, an extra heavy dressing of compost. It may be wise to procure a rest for the plants by cutting them more severely than is normally done so that they can rally their innate ability of combatting fungus disease. It may be a good idea too to add some extra amount of phosphate rock or colloidal phosphate to your compost because fungus diseases are almost invariably the result of malnutrition.

—o—

PHOSPHATES

Q. Does rock phosphate bring the same yields as superphosphate?

N. P., Virginia

A. In Texas, in experiments from 1914 to 1936, by the Texas Agricultural Experiment Station, superphosphate and rock phosphate alone produced an average yield of 20.0 and 19.2 bushels of corn per acre, respectively. Where manure was used with

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these materials, superphosphate produced an average yield of 204 lbs. of lint cotton per acre and rock phosphate 220 lbs. Aside from other reasons, the extra price paid for superphosphate would hardly seem warranted by the results, as compared with rock phosphate.

—o—

LILIES

Q. Should I plant lilies at the same time as glads? Or should I plant them when the tulips are set out?

J. O'C., Morgantown, W. Va.

A. Different lilies have different habits, but all had best be transplanted when the leaves have died down and when the bulbs have entered their dormant stage. In other words, they should be treated like other perennials and planted or transplanted in fall. This keeps the bulbs from drying out. From August till October is the best time. But if for some reason or other you have bulbs now, you had better put them in the ground than wait until late summer. If you can manage, take care that they can expand in time, that the ground is well drained, which is necessary for most lilies, and that the ground does not dry out. Any low-growing plants that form a ground cover without becoming too possessive, will be fine. Lilies do not like to grow all alone. A mulch of compost will be very helpful too.

—o—

HERB SEEDS

Q. When should herb seeds be sown? I have never had any luck with lavender seed. I have used seed from different sources, but cannot seem to get anywhere. Can you help out?

Miss J. R., Tucson, Arizona

A. You are not the only one. Lavender is one of the plants that are difficult for the skillful gardener who has plenty of experience. It may be better to buy plants, especially since lavender is not a quick grower. On the other

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hand, your region is well suited to this herb. If you insist on growing it from seed, do so in a flat, not in the open. Keep the flat covered with a glass, but let light and heat penetrate. You have probably kept your seeds too moist. They can stand a good deal of dryness and warmth, just as the plants can. The glass will keep the moisture they need, so that you will not be inclined to overwater. But lavender does not always perform well when grown from seed and it is best therefore to secure a cutting of this years growth at the end of the growing season and to root it in a pot inside. The majority of the other herbs, excepting peppermint, can be sown right into the open after danger of frost is passed, many even as soon as the soil can be worked.

—o—

BAGGED MATERIALS

Q. I am a recent subscriber to "Organic Gardening", and as such have read the last few issues with considerable interest. I have noted with care that many commercial fertilizers ruin bacterial life etc. and degenerate so to speak the life of the soil. On the other hand bone-meal and certain commercial preparations, for example "Phosphate Rock" advertised in your February 1946 issue, are purported to help compost and soil. I think it would be of interest to readers to publish, a list of recommended preparations which are an aid to 1. The Compost Pile, and 2. to the soil applied directly.

J. McI., Pittsburgh, Pa.

A. You can use without danger, though, of course, depending on the needs of your soil, the following: Lime other than quick lime, preferably in the form of ground limestone; phosphate rock and colloidal phosphate, but not super phosphate; dolomitic limestone as a source of magnesium but not magnesium sulphate, epsom salts, etc., wood ashes as a source of potash, but not coal ash. Coal ash can be used on the walks of the gar-

den. All the materials of plant and animal origin such as peat moss, which makes the soil acid, redwood bark, sold under the name of Sani-soil, cottonseed meal, which also acidifies the soil, chicken manure, dried blood, hoof and horn meal, bonemeal, tankage and with certain precautions, sewage sludge if ground up and composted.

These materials give you all the necessary plant foods except in cases where special deficiencies exist. They are not likely to occur in your area. It is always best to use these substances in the compost, but lime and rock phosphate as well as the organic substances may well be used directly on the ground.

—o—

FERNS AND RUST

Q. My ferns have a strange rust on them. When the leaves are shaken little reddish dust parts fly off. They come from a growth underneath the leaves. How can I cure this?

Mrs. E. V. Z., Long Island, N. Y.

A. Your description fits nothing so well as the spores of the ferns. You find on the underside of the leaves little ridges or clusters usually of a rusty color; in them are the spores which are the means of fern propagation. These spores germinate in moist soil and produce a leaf-like growth on which male and female organs are formed. Here sexual reproduction takes place. Similar modes of reproduction in two phases occur in many of the lower plants and accordingly in many of the parasitic ones that cause diseases in human bodies. We hope to discuss this interesting topic in a later issue.

There are some diseases that befall ferns, especially under cultivation, and they had best be cured by changing unfavorable conditions of growth. These vary with different species and

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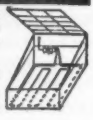

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if you name the kinds of fern you have, we can tell you where they should be grown. Woodsia and Osmunda want more sun and light than the majority, which prefer moist and shaded spots. But since all ferns naturally produce spores which depend on moisture for their further life cycle, dryness is sometimes the cause of failure; it is foreign to the nature of most ferns.

—o—

COMPOST QUANTITIES

Q. How much compost, ground limestone and phosphate roch should I use in my vegetable garden?

E. L. M.,
Manhasset, Long Island, N. Y.

A. Naturally, only a general rule or average can be given, as individual requirements vary, depending upon the condition of the soil, previous treatment, crops to be grown, and various other related factors. For most gardens, 200 lbs. of compost or humus to each 500 sq. ft. of land surface, or about a bushel to each sq. yd. would be about right. It should promptly be worked into the upper 8" of top-soil and not allowed to remain on the surface of the soil where further weathering would result in deterioration of plant nutrients. About 50 lbs. of ground limestone to each 1,000 sq. ft. of land surface, and a similar quantity of phosphate rock every three years, will be helpful soil amendments. The limestone and phosphate rock should be included in the compost heap, but if this has not been done they could be added directly to the land. A mulch of grass cuttings, leaves, or hay after the compost has been distributed will increase its effectiveness.

—o—

GREENHOUSE METHODS

Q. It has long been my ambition to grow plants commercially, but I have to acquire the information about

how to do it from books. Which book would you suggest? I need a book written for greenhouse growing.

F. N. M., Gulfport, Miss.

A. For systematic treatment of the whole field the books by Professor Alex Laurie of Ohio State University are unsurpassed. While Laurie uses chemical fertilizers, you, as an organic gardener, will be able to substitute composts and organic fertilizers; but temperature, light, and soil requirements are admirably treated by Laurie. His book, *Commercial Flower Forcing,* published by Blakiston, Philadelphia, contains all the information you need. He gives also references to other writings, including Government bulletins, so that you can follow up the lines you find most interesting.

—o—

SODS AND COMPOST

Q. In your article on Allwood and the Allwood carnations, you mention a compost made from sod. How do you make such compost and wherein does it differ from the Indore method?

R. B., Carmel, Cal.

A. For gardening purposes we often need a good humus soil that is not too rich in manure. Oldfashioned growers used to prepare such humus by stripping the sod from a pasture and laying the rolls or pieces upside down, building a compost heap consisting of green matter and earth only. No manure was added. As a result, the heap breaks down rather slowly, since the bacteria do not find much nitrogen for their development. They cannot grow so fast as when animal matter is added. The sod heaps will therefore require at least a year until they are broken down. Weed seeds and disease organisms and insect larvae are usually still alive. It is therefore good practice to allow chickens to pick over this kind of compost. If you add manure in the building process, the heap will heat up, seeds and insect larvae will be destroyed, and

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—o—

BUILDER'S GARDENS

Q. Last November I bought a new home in this suburb of New York City. Around the trees and shrubs I piled some of the earth the builders had excavated in digging the foundation for the house. I am told that I should not have done this. But good top-soil is hard to get. What shall I do now?

L. F., New York

A. Excavated earth is a relatively sterile sub-soil, as contrasted with the rich top-soil you should use. Whether sandy or of clay, it is lacking in the beneficial bacteria, earthworms and other organisms that play so important a part in promoting plant growth by improving soil structure and making available the nutrients or food needed by growing things. Compost, humus or leaves would have been excellent amendments around those trees and shrubs. When you say you "piled" the earth around these, we fear you overlooked the fact that you should never raise the level of the soil around plants above that to which they have been accustomed. Piling earth around trees or bushes is apt to "smother" them. Aside from that, any shock or change in environment handicaps plants, especially if the trees and shrubs around your home recently had been transplanted. The best way out is this: Get leaves or other organic matter and some manure or other animal matter, such as chic-

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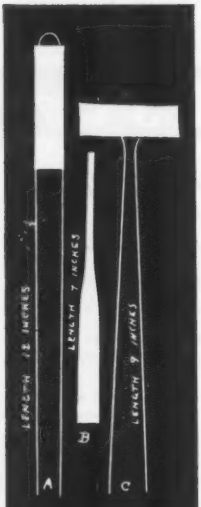

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ken manure in bags, dried blood, hoof and horn dust, and make a good compost. Then rake the earth away from the trees and shrubs, spreading it over the whole place and giving at the same time a topdressing of compost. This will change the subsoil into topsoil and ultimately benefit your whole garden or lawn.

—o—

FALLOWING

Q. What do you think of giving the farm occasionally a rest?

J. H. F., Detroit, Michigan

A. We have long favored this tried and true old-time method, especially at times as in the 1930s when surplus crops were being "plowed-under." When we speak of fallowing, we do not mean to leave the land bare but to rest it from cultivated crops by growing legumes and grasses. To leave the land bare would, of course, subject it to erosion dangers.

—o—

MULCH

Q. I am much interested to know the results of your vegetable garden mulching.

Mrs. V. R. C., Winfield, Kansas

A. Putting a straw mulch between the rows of vegetables made cultivation unnecessary on the organic farm. It also cut out weeding. That alone saved a great deal of labor. At the same time it keeps pests from crawling up and jumping around while the soil gets a shading and an addition of organic matter and also stays in good moisture.

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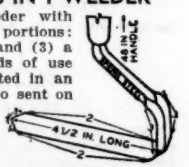

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ORGANIC GARDENING — EMMAUS, PA.

CHICKEN DROPPINGS

Q. We have a poultry farm, giving us a large amount of chicken manure. Will this be a good thing to use in making compost?

J. B. N., Fayetteville, Tenn.

A. Poultry manure is especially fine for composting—as it is richer than other manures. It is highly concentrated, and should never be applied directly to the land, as it would burn the plants. Because the urine is with the poultry manure, and not lost as in the case of animal manures, it has a great deal of rich nitrogen compounds. Lime helps to preserve these. In our November, 1945 issue we described dropping pits that provided an automatic form of composting. These may more economically be built along one side of the poultry house, with an outside entrance, so that the pits may be cleaned out easily and the compost loaded on manure spreaders or trucks and immediately disced or plowed into the soil. The construction of one of these pits for poultry is as follows: Excavate 3 or 4 feet and put a layer of stone at the bottom of this; then comes a layer of rich top-soil; then a thin layer of old rotted manure or compost as a culture because of the bacteria it contains. Droppings fall on this, and once a week—or oftener if desired—leaves, grass cuttings, plants, kitchen wastes (without fats or greases), and good earth with a little lime, are added. We follow this system on our 63 acre experimental farm and the poultry house is free of objectionable odors, even in Summer. This checks bronchial ailments and other poultry diseases, and makes a pleasanter place for the poultryman to work in.

—o—

WEEDS

Q. I own two acres in the country but do not live on the land. Last spring, I planted my fruit trees and berry bushes around the place where my home will be built in the near

future, and during last summer the weeds overran the land.

As I live in the city and only go out there on week-ends, I was unable to control the weeds.

If I planted white clover in the space left, would it kill the weeds?

L. A. B., Chicago, Ill.

A. White clover would not serve your purpose. This is a low growing plant with relatively short roots. We would recommend alfalfa as an aid in checking the weeds, as this grows high, has deep roots, and is a long range perennial. Some liming may be necessary as alfalfa has an affinity for an alkaline condition.

—o—

LAKE DEPOSITS

Q. Can I use black muck and moss from a lake in the compost pile?

G. L. W.,
Grosse Points, Mich.

A. Yes, but let them weather first and incorporate a somewhat heavier sprinkling of lime to counteract acidity. Also apply phosphate rock to the land, if you cannot use it in making the compost.

—o—

MANURE SUBSTITUTES

Q. Please advise whether bone meal would be a suitable substitute for cow manure in making compost when fruit and vegetable cuttings and some dried leaves are used. How much bone meal should be used? Would dried blood and bone meal be more desirable?

W. Y. H.,
Pottsville, Pa.

A. Bone meal alone will not be enough as a substitute for manure because it does not contain sufficient amounts of nitrogen, but if you can

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get horn dust, you should get all the nitrogen you need. Since bone meal, however, is an excellent source for natural phosphorus, it is well to incorporate some of it as gardeners have done for a long time.

A hundred pound bag of horn dust would give you about as much nitrogen as a thousand pounds of manure. Dried blood would give you about as much as 500 pounds of manure. It is best to apply these materials in moist form after first stirring them up in a tub and pouring it over the green matter. Bone meal has some additional nitrogen, but since it is not immediately released, it would be better to disregard that aspect and just give a sprinkling of the substance in addition to either horn dust or dried blood. If you can get hoof and horn meal, you get a valuable substance too, but it does not decay so readily and you will have to apply greater amounts. You can apply it directly to the ground.

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A Review of

Pay Dirt

By WALTER MAGNES TELLER
(Author of "What is Farming?")
in The Progressive

I'll tell why *Pay Dirt* strikes me as one of the most interesting and important books on farming. It is because this book explains a substantial aspect of the revolution in farming and gardening which is going on all over the world. It deals with the problem of maintaining and, where necessary, creating fertile soil.

Sir Albert Howard, author of the already classic *An Agricultural Testament,* in his introduction to *Pay Dirt* describes a fertile soil as "the formulation of healthy crops, healthy livestock, and last but not least, healthy human beings. By a fertile soil is meant one to which Nature's law of return has been faithfully applied, so that it contains an adequate amount of freshly prepared humus made in the form of compost from both vegetable and animal wastes."

Rodale's *Pay Dirt* is a book for the amateur gardener, the professional farmer, and the more serious moments of the general reader. Mr. Rodale argues the theory and practice of compost with both passion and reason for he is both student and farmer. He clearly and simply describes the biologic life of the soil, the Howard method of scientific composting, the dangers of chemical fertilizers, the relationship of health or disease to food, and his own notions of good and bad farming practices.

If Edward Faulkner's *Plowman's Folly* left you confused on whether to plow or not to plow, I recommend reading *Pay Dirt.* Experience taught me, like thousands of farmers, that corn, for example, likes plowed land; that I must plow occasionally to control certain weeds. I think Mr. Rodale has shown why this is so. And he has also said and demonstrated things about the control of insect, plant, and animal pests which impress me very much. I don't think my farming will ever be the same. I think I may have bought my last bag of superphosphate. I want to see a manure loader in action.

Mr. Rodale has done a fine job of bringing together such intimately related subjects as crop production, animal husbandry, soil erosion, food, nutrition, and health, which have become fragmentary units, each in the hands of a group of specialists.

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